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OF THE

SCIENTIFIC MEETINGS

OF THE

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FOR THE YEAR

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Page 178, top line, for *villicollis* read *vitticollis*.
„ 303, line 24 from the bottom, *for* p. 208 *read* p. 298.
„ 503, „ 26 from the bottom, for *macroscelis* read *macrocelis*.
„ 682, „ 24 from the bottom, for *jussoni* read *gussoni*.
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January 3, 1882.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

Mr. W. A. Forbes exhibited and made remarks on the horns shed by the male Prongbuck (*Antilocapra americana*) living in the Society's Gardens since December 1879, which had been dropped, one on November 15 and the other on November 24, of 1881. This, it was believed, was the first instance on record of one and the same individual of this species having shed its horns in consecutive years, though that this event took place periodically had been rendered nearly certain from previous observations[1].

Professor Owen, C.B., F.R.S., read the twenty-third of his series of memoirs upon the extinct birds of the genus *Dinornis* and its allies.

The subject of this memoir had been discovered, during the construction of a road in Nelson province, South Island of New Zealand, in a cavern of that remote district. Along with the skeleton was found the ossified windpipe and some small smooth pebbles lying in the position of the gizzard. The skeleton (the most complete framework of one and the same individual Moa that had reached England) had been offered for sale, and, on the recommendation of the author, had been purchased by the Trustees of the British Museum, and was being exhibited (articulated) in the Museum of Natural History, Cromwell Road.

The bones showed the maturity, if not the old age, of this

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[1] See Mr. Forbes's article, P. Z. S. 1880, p. 540.

Page
[illegible] 451
[illegible] 452
[illegible] 520

[illegible] proportions [illegible] larger [illegible] The [illegible] been discovered [illegible] middle of the [illegible] size or by [illegible] surface for a [illegible] were transmitted, [illegible] *Dinornis* received additional support [illegible] about that of the Dodo.

On the grounds detailed in the memoir the author [illegible] subject to the genus *Dinornis*, and to a new species [illegible] called *D. parvus*.

In the remote, well-wooded, and sparsely populated [illegible] southern division of New Zealand, Prof. Owen was of opinion [illegible] recovery of a still-existing specimen might be less unlikely than that of the *Notornis*, also originally recognized by fossil remains.

This memoir will be printed entire in the Society's 'Transactions.'

The following papers were read :—

1. Liste des Oiseaux recueillis par M. Stolzmann au Pérou nord-oriental. Par L. Taczanowski, C.M.Z.S.

[Received November 28, 1881.]

(Plates I. & II.)

Les oiseaux de cette liste ont été collectionnés pendant les vingt mois depuis le 13 septembre de 1879 jusqu'en avril de 1881, dans les localités suivantes :—

a. Localités situées sur le versant occidental de la chaîne orientale des Cordilières (système du Haut Marañon).

Chachapoyas. Chef lieu du département Amazonas, élevé à 7600 pieds au dessus du niveau de l'océan, situé dans le système de Rio Utcubamba, un des affluents de la rive droite du Marañon. Cette localité, dépourvue de forêts, appartient à la région connue par les habitants sous le nom de la Sierra. La contrée est en grande partie couverte de pâturages et de broussailles, et ce n'est que dans le fond des ravins qu'on rencontre la végétation un peu plus riche, composée principalement d'un arbuste épineux nommé "zarza" entremêlé d'aulnes, en y formant des surfaces plus ou moins vastes de broussailles basses, presque impénétrables, parsemées çà et là de groupes

8000 pieds ; une partie de sa pente et son sommet sont couverts de forêts.

Huambo. 3700 pieds d'altitude. Plantation inhabitée au fond de la forêt vierge, à 10 kilomètres de Chirimoto, au bord de la rivière Huambo, qui, comme on le prétend, se rend près de Pachiza au fleuve de Huallaga. C'estune forêt chaude et humide, du caractère des forêts vierges, analogue sous le rapport des conditions naturelles à l'Amable-Maria du Pérou central, exploré par M. Jelski.

Yurimaguas. Ville située sur la rive gauche de Huallaga, au point de sa réunion avec la Paranapura ; entourée de forêts vierges chaudes et humides, élevée à peine à 500 pieds au dessus du niveau de l'océan.

Comme dans les listes précedentes, chaque espèce fournie pour la première fois par M. Stolzmann et non fournie par son prédécesseur est marquée d'un astérique devant son numero ; 160 espèces sont donc nouvelles pour l'exploration de nos voyageurs, et ne se trouvent pas dans leurs listes précédentes, et plusieurs d'entre elles sont nouvelles pour la faune péruvienne, dont quelques-unes sont nouvelles pour la science.

TURDIDÆ.

1. **TURDUS IGNOBILIS**, Scl.

Turdus leucomelas, V. ; Tacz. P. Z. S. 1874, p. 503.

Six exemplaires recueillis à Chirimoto et à Huambo, en juillet et mars. Iris brun grisâtre foncé.

2. **TURDUS CROTOPEZUS**, Licht. ; Tacz. P. Z. S. 1874, p. 503.

Une femelle de Huambo du 28 février 1880. Iris brun foncé.

3. **TURDUS NIGRICEPS**, Jelski ; Tacz. P. Z. S. 1874, p. 503, tab. lxiv.

Un exemplaire, sans indication de sexe, tué à Chirimoto le 29 juillet 1880, s'accordant en tout avec l'exemplaire typique, à dimensions un peu plus fortes, l'aile pliée mesurant 113 mill., le bec un peu plus long. Les bordures blanches des plumes de la gorge sont un peu moins larges que chez l'exemplaire cité. Rencontré une seule fois par notre voyageur.

4. **TURDUS SWAINSONI**, Cab. ; Tacz. P. Z. S. 1871, p. 503 ; 1879, p. 221.

Trois exemplaires de Tamiapampa et de Huambo.

5. **TURDUS SERRANUS**, Tsch. ; Tacz. P. Z. S. 1874, p. 504 ; 1879, p. 221.

Une femelle de Tamiapampa du 17 novembre 1879.

6. **CATHARUS FUSCATER**, Lafr. ; Tacz. P. Z. S. 1874, p. 507 ; 1879, p. 222.

Un mâle de Chachapoyas du 22 septembre 1879. Iris blanc sale.

*3. CYPHORHINUS SALVINI, Sharpe, Cat. B. Brit. Mus. vi. p. 292, pl. xviii. fig. 1.

La coloration de cet oiseau est semblable en tout à celle du *C. modulator*, mais la nuance des parties supérieures du corps est d'un brun foncé moins roussâtre, cette différence est la plus frappante sur les bandes claires des rémiges ; la couleur rousse de la gorge et de la poitrine est beaucoup plus foncée. Le bec est noir corné, au dessous de la mandibule inférieure blanc d'ivoire, brusquement séparé de la couleur foncée ; pattes cornées foncées ; iris brun-foncé.

Longueur totale ♂ 155, vol 242, aile 73, queue 40, bec 24, tarse 23, doigt médian avec l'ongle 22 millim.

Trois mâles tués à Yurimaguas en février 1881.

4. MICROCERCULUS MARGINATUS, Scl.; Tacz. P. Z. S. 1877, p. 506.

Deux mâles tués à Yurimaguas le 16 et le 21 février 1881, qui paraissent être jeunes. Ils ont le brun des parties supérieures du corps plus fortement ferrugineux que chez l'adulte de l'Amable-Maria ; le blanc du dessous squamulé par les bordures des plumes brunes, plus fines sur la gorge et plus grosses sur le milieu de l'abdomen ; les flancs plus ferrugineux et également variés ; les plumes du sommet de la tête plus distinctement squamulées d'une nuance plus foncée ; les grandes et les moyennes tectrices alaires marquées près de leur extrémité d'une fine strie rousse. Les squamules foncées du dessous sont moins prononcées sur un des ces exemplaires. Iris brun-foncé.

MNIOTILTIDÆ.

1. DENDRŒCA BLACKBURNIÆ (Gm.); Tacz. P. Z. S. 1871, p. 508; 1879, p. 223.

Trois exemplaires de Huambo.

2. DENDRŒCA CÆRULEA (Wils.); Tacz. P. Z. S. 1874, p. 508.

Trois exemplaires recueillis à Huambo le 10 février et le 15 mars 1880. Iris brun foncé.

3. GEOTHLYPIS ÆQUINOCTIALIS (Gm.); Tacz. P. Z. S. 1880, p. 191.

Un mâle de Chirimoto.

4. MYIODECTES CANADENSIS (L.).

Dendrœca canadensis, Tacz. P. Z. S. 1874, p. 508; 1879, p. 223.

Six exemplaires de Huambo.

5. BASILEUTERUS CORONATUS (Tsch.); Tacz. P. Z. S. 1874, p. 509.

Cinq exemplaires de Cococho, de Ray-urmana, de Chachapoyas, et de Tamiapampa. Iris brun foncé.

6. BASILEUTERUS UROPYGIALIS, Scl.; Tacz. P. Z. S. 1874, p. 509.

Un exemplaire de Huambo du 12 mars 1880. Iris brun foncé.

d'un jaune plus pâle que celui de l'abdomen. Queue olive grisâtre. Bec brun-rougeâtre clair; pattes carnées; iris ocreux jaunâtre, un peu plus foncé intérieurement qu'à l'extérieur.

♂. Longueur totale 138, vol 200, aile 62, queue 52, bec 14·5, tarse 19 millim. ♀. Longueur totale 136, vol 193, aile 58, queue 52, bec 15, tarse 19 millim.

4. **Cyclorhis contrerasi**, Tacz. P. Z. S. 1879, p. 224, tab. xxi.; 1880, p. 192.

Trois exemplaires de Chachapoyas. Le sommet de la tête coloré au milieu de verdâtre sur un espace restreint.

Hirundinidæ.

*1. **Hirundo albiventris**, Bodd.

Un exemplaire tué à Yurimaguas le 14 février 1881. Iris brun foncé.

*2. **Atticora fasciata** (Gm.).

Un exemplaire de Yurimaguas du 14 février 1881. Iris brun foncé.

3. **Atticora cyanoleuca** (V.); Tacz. P. Z. S. 1874, p. 510; 1879, p. 224; 1880, p. 192.

Un exemplaire tué à Huambo le 5 avril 1880.

4. **Atticora cinerea** (Gm.); Tacz. P. Z. S. 1874, p. 510.

Un exemplaire tué à Tamiapampa le 30 octobre 1879.

Cœrebidæ.

1. **Diglossa brunneiventris**, DesMurs; Tacz. P. Z. S. 1874, p. 511; 1879, p. 225.

Un jeune mâle de Tamiapampa du 29 octobre 1879.

2. **Diglossa sittoides** (d'Orb. et Lafr.); Tacz. P. Z. S. 1874, p. 511.

Un jeune oiseau d'Achamal du 27 août 1880.

3. **Diglossa personata**, Fras.; Tacz. P. Z. S. 1874, p. 511; 1880, p. 193.

Une paire de Tamiapampa du 27 octobre 1879.

4. **Diglossopis cærulescens**, Scl.; Tacz. P. Z. S. 1874, p. 511; 1879, p. 225.

Plusieurs exemplaires de Chachapoyas, de Tamiapampa et d'Achamal, recueillis entre le 13 septembre 1879 et le 23 août 1880.

5. **Conirostrum atrocyaneum**, Lafr.; Tacz. P. Z. S. 1874 p. 511; 1879, p. 225.

Un mâle adulte tué à Tamiapampa le 4 novembre 1879, à sommet de la tête aussi bleu que chez ceux du Pérou central.

6. **Dacnis cayana** (L.); Tacz. P. Z. S. 1874, p. 510.

Quatre exemplaires recueillis à Huambo en février 1880.

7. **Dacnis modesta**, Cab.; Tacz. P. Z. S. 1874, p. 510.

Deux femelles de Huambo tuées en mars 1880, semblables en tout au type de la description.

8. **Dacnis xanthophthalma**, Tacz. P. Z. S. 1874, pp. 131, 510.

Une femelle tuée à Tamiapampa le 22 novembre 1879, tout à fait semblable à l'oiseau typique.

*9. **Chlorophanes atricapilla** (V.).

Deux femelles de Huambo et de Yurimaguas, tuées le 24 mars 1880 et le 20 février 1881. Iris rouge brunâtre chez l'adulte, et d'un brun foncé chez le jeune.

10. **Cœreba cyanea** (L.).

Cœreba nitida, Tacz. P. Z. S. 1874, p. 510.

Deux mâles de Huambo, tués le 7 mars et le 24 avril 1880.

Tous les oiseaux péruviens que j'ai vu ont la nuance bleue beaucoup plus claire que chez les oiseaux de Cayenne et du Brésil, surtout sur la tête; la couleur noire également disposée sur la gorge comme chez ces derniers; en outre ils ont le bec moins long.

TANAGRIDÆ.

1. **Chlorophonia torrejoni**, n. sp. (Plate I. fig. 1.)

Chlorophonia viridis, Tacz. P. Z. S. 1879, p. 225.

Ch. *prasino-viridis; semitorque nuchali latissimo, circuloque oculari cœruleis; ventre medio flavo; pectore hypochondriisque flavo-olivaceis; remigibus nigricantibus viridi marginatis. Rostrum nigrum; pedes cinereo-plumbei; iris fusco-brunnea.*

♂ ad. Toute la tête avec la gorge et le devant du cou est d'un beau vert de pré luisant, avec un léger ton jaunâtre au front; un large croissant d'un bleu outremer occupe la nuque et le derrière du cou, en s'amincissant graduellement sur les côtés de ce dernier; un anneau d'un bleu plus pâle que celui du croissant nuchal entoure finement l'œil; le dos est couvert de plumes d'un vert brunâtre foncé, terminées d'une bordure verte; le croupion et les sous-caudales sont d'un vert malachite. En dessous le milieu du ventre et les sous-caudales sont d'un jaune souffre, la poitrine et les flancs d'un olive jaunâtre. Tectrices alaires vertes olivâtres; rémiges noirâtres bordées finement de vert olivâtre à l'extérieur et de gris blanchâtre intérieurement; sous-alaires jaunâtres, et grises le long du bord de l'aile. Rectrices noirâtres avec une fine bordure externe verdâtre. Bec noir avec la partie grise au dessous des narines, à mandibule grise foncée et noirâtre au bout et en dessous; pattes plombées; iris brun foncé.

♀. La femelle semblable au mâle, à couleurs un peu moins pures et moins vives; surtout le collier est moins vif et moins uniforme.

♂. Longueur totale 123, vol 198, aile 59, queue 34, bec 11, tarse 15 millim. ♀. Longueur totale 123, vol 205, aile 63, queue 34, bec 11, tarse 15 millim.

Six exemplaires tués en juin et en août à Chirimoto.

Je dédie ce beau Tanagride à Don Tomas Torrejon, propriétaire de Tamiapampa, Alcade municipal de Chachapoyas, comme preuve de ma gratitude pour son bienveillance et l'amitié sincère envers notre voyageur.

*2. **Euphonia chalcopasta**, Scl. et Salv. Nomencl. Av. Neotr. p. 157.

Onze exemplaires des deux sexes tués à Chiromoto et à Huambo en mai et en juillet 1880. Iris brun foncé; bec noir à mandibule cendrée, terminée de noir; pattes grises.

La jeune femelle diffère des adultes par le manque de l'éclat métallique sur les parties supérieures du corps, dont le sommet de la tête est lavé de jaune olive jusqu' à la cervix, qui avec la nuque est d'un plombé, tirant au bleuâtre dans certaines directions de la lumière; le dos est d'un vert olive tirant au jaunâtre sur le croupion et les suscaudales; les côtés de la tête sont d'une nuance plus pâle que le dos; gorge grise jaunâtre; milieu de la poitrine et du devant de l'abdomen sont d'un gris terreux, passant à l'ocreux pâle sur le milieu du ventre; les flancs du corps largement d'un vert jaunâtre. Les rémiges et les rectrices comme dans le mâle.

3. **Euphonia nigricollis** (V.)?

Deux jeunes femelles de Huambo, tuées en avril 1880.

Il est probable que ces deux oiseaux appartiennent à l'*E. insignis*, Scl. et Salv., car ils diffèrent légèrement des jeunes de l'*E. nigricollis*.

4. **Euphonia xanthogastra**, Sund.; Tacz. P. Z. S. 1874, p. 518.

Sept exemplaires recueillis à Huambo depuis février jusqu'en avril 1880. Iris brun foncé.

5. **Pipridea melanonota** (V.); Tacz. P. Z. S. 1879, p. 226.

Un exemplaire de Huambo.

*6. **Diva branickii**, n. sp. (Plate I. fig. 2.)

D. *læte cærulea; capite cum nucha griseo-virente, stramineo micante; remigibus rectricibusque nigris.*

♂. Couleur générale de tout le corps est d'un beau bleu un peu différent de celui de la *D. vassori*, et tirant également sous certain jour au violet comme chez l'espèce citée; le sommet de la tête avec la nuque et les joues est d'une couleur séladon grisâtre, fort luisant, passant légèrement au bleuâtre sous certain jour et au straminé verdâtre dans une autre direction de la lumière; les lores sont également noirs, mais d'une nuance moins intense que chez la *D. vassori*; la bordure du front et celles du menton à peine indiquées. Tectrices alaires comme chez l'autre espèce, d'un bleu uniforme sur les petites et les moyennes, et noires avec une large bande terminale sur les grandes; les rémiges et les rectrices noires, également bordées de bleu, mais plus saphyré. Bec noir; pattes brunes cornées; iris brun foncé. Les mâles, probablement moins adultes, ont les plumes du bas ventre tirant plus ou moins au gris verdâtre, analogue à celui de la tête.

♀. Comme dans la *D. vassori* la femelle a les couleurs moins pures à cause de la transparence du foncé de la base des plumes; cependant la couleur de la tête est la même que chez le mâle, mais d'une nuance moins pure.

Les jeunes en premier plumage ressemblent en tout à ceux de la *D. vassori*; ils sont d'un gris foncé en dessus, tirant légèrement au verdâtre sur le dos, et un peu plus fortement sur les scapulaires; le dessous du corps est d'un gris plus pâle, à plumes du milieu du ventre largement bordées de blanchâtre; les petites tectrices alaires un peu plus foncées que le dos, les grandes bordées de vert bleuâtre; rémiges et tectrices noirâtres, bordées extérieurement de bleu.

♂. Longueur totale 150, vol 240, aile 76, queue 53, bec 13, tarse 14, doigt médian avec l'ongle 17 millim. ♀. Longueur totale 148, vol 235, aile 74, queue 53, bec 13, tarse 14, doigt médian avec l'ongle 17 millim.

Plusieurs exemplaires des deux sexes recueillis à Tamiapampa en octobre et en novembre 1880.

7. Calliste yeni (d'Orb. et Lafr.); Tacz. P. Z. S. 1874, p. 514.

Un mâle tué à Yurimaguas le 2 avril 1881.

*8. Calliste cœlicolor, Scl.

Onze exemplaires des deux sexes recueillis à Huambo en janvier, février et mars 1880. Iris brun-foncé.

9. Calliste xanthogastra, Bp.; Tacz. P. Z. S. 1874, p. 514.

Un mâle tué à Huambo le 10 mars 1880. Iris brun foncé.

10. Calliste pulchra (Tsch.); Tacz. P. Z. S. 1874, p. 514.

Cinq exemplaires des deux sexes de Huambo, tués en février et en mai 1880. Iris brun foncé.

11. Calliste gyroloides (d'Orb. et Lafr.); Tacz. P. Z. S. 1874, p. 514.

Huit exemplaires de Huambo, tués entre le 30 janvier et le 21 avril 1880.

12. Calliste argentea (Tsch.); Tacz. P. Z. S. 1874, p. 514; 1879, p. 226.

Une paire de Chirimoto, tuée le 5 juillet et en septembre 1880.

Le mâle unique de Paltaypampa, au Pérou central, tué le 13 mars, diffère des mâles du Pérou septentrional, tués en septembre, par la nuance des parties supérieures du corps, des flancs de l'abdomen et des bordures sur les rémiges et les rectrices bleues, comme dans la figure de la 'Fauna Peruana,' au lieu de vert-bleuâtres; ce qui est en relation avec le changement du plumage. L'exemplaire cité était en pleine mue, et toutes ses plumes fraiches présentent la couleur bleue, tandis que celles du plumage précédent sont de la même nuance que chez tous les oiseaux du nord.

*13. CALLISTE ARGYROPHENGES, Scl. et Salv.

Six exemplaires de Huambo, tués en avril 1880. Iris brun foncé; bec noir; pattes d'un gris plombé foncé.

La femelle a le sommet de la tête gris noirâtre, squamulé de verdâtre, plus distinctement au front, et moins sur la nuque; côtés de la tête et gorge d'un straminé, passant au vert bleuâtre pâle dans les autres directions de la lumière; le dos et le croupion sont d'un jaune verdâtre, plus clair sur ce dernier; scapulaires olives; poitrine bleue verdâtre pâle; milieu de l'abdomen largement gris, à plumes bordées de blanchâtre; flancs de la couleur du dos; sus-caudales olives, sous-caudales grises olivâtres bordées de blanchâtre. Ailes et queue noirâtres, à plumes bordées de vert olivâtre; les bordures des rémiges primaires d'un vert bleuâtre; sous-alaires externes grises lavées de vert, les internes blanches; bord interne des rémiges blanchâtre.

*14. CALLISTE NIGRICINCTA, Bp.

Un mâle de Huambo, tué le 9 avril 1880. Iris brun fonc .

*15. CALLISTE CHRYSOTIS, Du Bus.

Un mâle de Chirimoto, tué le 1 septembre 1880. Iris brun foncé.

16. CALLISTE CYANEICOLLIS (d'Orb. et Lafr.); Tacz. P. Z. S. 1874, p. 515.

Quatre exemplaires de Huambo et de Chirimoto.

Les œufs, recueillis à Corral et à Chirimoto en février, mars et en avril, sont ovés, médiocrement allongés, à coque mate, blanche ou d'un blanc légèrement jaunâtre, parsemé de taches irregulières violâtres peu nombreuses, presque également disposées partout, ou plus souvent rares et petites sur la grande moitié terminale, grosses et formant une large couronne dense autour du gros bout, qui est parsemé de petites, mais plus nombreuses qu'au sommet. Dimensions: 19 × 13·3, 19·2 × 14·1, 20 × 13·8 millim.

17. CALLISTE MELANOTIS, Scl. Ibis, 1876, p. 408, tab. xii. fig. 1.

Quatre exemplaires de Chiromoto et d'Achamal, tués en juillet et en septembre. Iris brun foncé.

18. IRIDORNIS ANALIS (Tsch.); Tacz. P. Z. S. 1874, p. 514.

Trois exemplaires de Ray-urmana, d'Achamal et de Chirimoto, tués en juin et en juillet 1880. Iris brun foncé.

M. Stolzmann prétend que ces oiseaux sont fort rapprochés par leurs habitudes aux Buarremons, et que leur place dans le système serait la plus naturelle auprès de ces derniers.

19. PŒCILOTHRAUPIS IGNICRISSA, Cab.; Tacz. P. Z. S. 1874, p. 514.

Trois femelles et un jeune en premier plumage, recueillis à Tamiapampa en octobre et en novembre 1879.

Le jeune oiseau en premier plumage a toutes les couleurs également disposées comme chez les adultes, mais les nuances sont moins intenses et moins pures, le noir est beaucoup moins foncé, le rouge du dessous et de la tache auriculaire tirant à l'orangé sale; le bleu du croupion et du devant de l'aile plus clair, moins luisant et moins uniforme; les sous-caudales noirâtres, largement terminées de rouge orangé; les rectrices bordées distinctement de bleuâtre. Iris brun foncé.

20. COMPSOCOMA SUMPTUOSA (Less.); Tacz. P. Z. S. 1874, p. 513.

Deux exemplaires de Chirimoto, tués en septembre 1880, sont d'une taille intermédiaire entre les exemplaires de l'Antioquia et ceux du Pérou central, s'approchant plus par leur taille aux premiers, et par la nuance des bordures externes des rémiges aux derniers.

		millim.		millim.
Longueur de l'aile dans l'oiseau de	Medellin	99,	de la queue	74
„ „	Chirimoto	94,	„	69
„ „	Auquimarca	89,	„	60

21. TANAGRA PALMARUM, Wied.

Tanagra melanoptera, Tacz. P. Z. S. 1874, p. 513.

Un exemplaire tué à Yurimaguas le 25 février 1881 est d'une taille égale à celle des oiseaux de la Guyane française et moins forte que l'oiseau du Pérou central.

22. TANAGRA CŒLESTIS, Spix; Tacz. P. Z. S. 1874, p. 513; 1880, p. 195.

Un mâle tué à Yurimaguas le 10 mars 1881, une femelle à Huambo le 12 février 1880.

Les œufs, recueillis en janvier, mars et avril, sont ovés, plus ou moins allongés, à surface faiblement polie, blanche sale, tachetée ou marbrée de nombreuses taches brunes violâtres inférieures, et brunes foncées superficielles; les taches sont irrégulières, de différentes dimensions, et plus ou moins également disposées sur toute la surface. Dimensions: 22·8 × 16·8, 24·2 × 17, 25 × 17·2, 26·5 × 16·8 millim.

23. TANAGRA CYANOCEPHALA (d'Orb. et Lafr.); Tacz. P. Z. S. 1874, p. 313; 1879, p. 227.

Un mâle de Chachapoyas.

24. TANAGRA DARWINI, Bp.; Tacz. P. Z. S. 1874, p. 513; 1880, p. 195.

Un exemplaire de Tamiapampa.

*25. **Ramphocelus jacapa** (L.).

Une paire de Yurimaguas tuée en février 1881, et une paire de Huambo tuée en février et en mars 1880.

Les deux mâles des deux localités se ressemblent en tout, et diffèrent des oiseaux de Cayenne par la nuance rouge moins forte sur les parties inférieures du corps, et presque nulle sur le milieu du ventre. La femelle de Yurimaguas ressemble à celle de Cayenne, tandis que la femelle de Huambo a la nuance générale plus claire, le devant du visage et de la gorge rouge, et tout le dessous du corps beaucoup plus enduit de rouge que chez les femelles de Yurimaguas et de Cayenne. Sous le rapport de la taille l'oiseau de Huambo est le plus grand, celui de Yurimaguas le plus petit, comme on le voit des dimensions ci-jointes :—

	Cayenne.		Yurimaguas.		Huambo.	
	♂	♀	♂	♀	♂	♀
Longueur totale....	—	—	194	186	198	190
„ du vol ..	—	—	260	246	273	254
„ de l'aile ..	81	74	76	73	83	78

Les œufs, recueillis à Huambo et à Corral en janvier et en février, sont ovés ou elliptiques, courts, à surface lisse ; le fond est vert bleuâtre assez pâle, parsemé de points et de gouttes noires, plus ou moins régulièrement arrondies, quelquefois de taches irrégulières, en général peu nombreuses, plus souvent plus nombreuses au gros bout, rares au sommet, rarement distribuées également sur toute la surface. Dimensions : 22·4 × 16·7, 22·4 × 17, 23 × 17, 23·8 × 17·2 millim.

26. **Pyranga azaræ** (d'Orb. et Lafr.) ; Tacz. P. Z. S. 1874, p. 514 ; 1879, p. 277 ; 1880, p. 195.

Quatre exemplaires de Chirimoto.

*27. **Pyranga ardens** (Tsch.).

Huit exemplaires des deux sexes, et en différents plumages, de Chirimoto, Huambo et d'Achamal, recueillis en mars, juillet et septembre. Iris brun foncé.

28. **Phœnicothraupis rubica** (V.) ; Tacz. P. Z. S. 1874, p. 513.

Trois exemplaires recueillis à Yurimaguas en janvier 1881. Iris brun foncé.

29. **Trichothraupis quadricolor** (V.) ; Tacz. P. Z. S. 1874, p. 513.

Quatre exemplaires de Huambo.

30. **Tachyphonus rufiventris** (Spix) ; Tacz. P. Z. S, 1874, p. 513.

Une paire de Yurimaguas du 15 mars et du 26 février 1881. Iris brun foncé.

*31. TACHYPHONUS MELALEUCUS (Sparm.).

Six exemplaires des deux sexes de Chirimoto et de Huambo.

Les mâles de cet oiseau ont la taille beaucoup plus forte que ceux de Cayenne. Longueur totale 220, vol 298, aile 96, queue 93 millim. Les œufs, recueillis en février et en mars à Corral et à Chirimoto, ressemblent en tout à la figure de Messrs. Sclater et Salvin dans le P. Z. S. 1879, tab. xlii. fig. 5. Leur surface est fort polie et luisante. Ils présentent beaucoup de variétés sous le rapport de la grandeur et de la forme des taches. Le fond est d'un rougeâtre sale pâle, rarement blanchâtre ; les taches inférieures violâtres pâles, les superficielles, d'un brun très foncé ; généralement elles sont rares, plus ou moins denses au gros bout ; quelquefois il y a de très grosses, souvent des veines épaisses et des zigzags ; il y a aussi des exemplaires dont la maculature est réduite a une fine moucheture pâle. Dimensions : 22·8 × 16·8, 21·8 × 17, 23·2 × 17, 24·8 × 18, 26 × 19 millim.

32. NEMOSIA GUIRA (L.) ; Tacz. P. Z. S. 1877, p. 744.

Un mâle adulte de Huambo, tué le 5 avril 1880. Iris brun foncé.

33. CHLOROSPINGUS LEUCOGASTER (Tacz.).

Dacnidea leucogastra, Tacz. P. Z. S. 1874, p. 131, tab. xix. fig. 2.
Dacnidea albiventris, Tacz. P. Z. S. 1874, p. 510 (errore).

Six exemplaires des deux sexes de Tamiapampa et de Chachapoyas. La femelle ne diffère en rien du mâle.

Selon l'opinion de M. Stolzmann, c'est un oiseau très voisin du *Ch. superciliosus*, et habitant la chaine orientale du Pérou septentrional et le Pérou central, tandis que le *Ch. superciliosus* se trouve dans les localités analogues de la chaine occidentale du Pérou septentrional. En comparant ces deux oiseaux, il est évident qu'ils ne se distinguent que par la couleur ; le vert olive du *Ch. superciliosus* est remplacé par le gris foncé chez le *Ch. leucogaster*, le jaune par le blanc ; la ressemblance entre ces deux formes se manifeste même dans la disposition de la bande sourcilière et des taches aux joues. Sous le rapport de leurs habitudes les deux oiseaux se ressemblent en tout ; ils habitent en petites bandes les forêts, et se tiennent dans les couronnes des arbres, où ils sont moins remuants que les *Dacnis*. La voix des deux espèces est semblable à ce point, que M. Stolzmann en entendant pour la première fois l'oiseau oriental, croyait reconnaître la voix de l'oiseau occidental. Le genre de *Dacnidea* doit donc être annulé.

34. BUARREMON ASSIMILIS (Boiss.); Tacz. P. Z. S. 1880, p. 196.

Un exemplaire de Chachapoyas.

35. BUARREMON BRUNNEINUCHUS (Lafr.) ; Tacz. P. Z. S. 1874, p. 515 ; 1879, p. 228 ; 1880, p. 197.

Un exemplaire de Tamiapampa.

36. BUARREMON LATINUCHUS, Du Bus; Tacz. P. Z. S. 1880, p. 197.

Buarremon specularis, Tacz. P. Z. S. 1879, p. 228.

Six exemplaires de Chachapoyas et de Tamiapampa, tués en septembre et en novembre 1879.

*37. ARREMON ERYTHRORHYNCHUS, Scl. P. Z. S. 1855, tab. lxxxix.

Un mâle et une femelle de Huambo, tués en janvier 1880. Iris brun foncé.

*38. CISSOPIS MEDIA, Scl.

Une femelle de Yurimaguas, tuée le 4 mars 1881. Iris jaune.

39. PSITTOSPIZA ELEGANS, Tsch.; Tacz. P. Z. S. 1874, p. 518.

Deux exemplaires de Tamiapampa et de Ray-urmana, semblables aux oiseaux du Pérou central par la disposition de la couleur rousse sur le visage, et non à ceux de la Nouvelle Grenade et de l'Antioquia.

40. SALTATOR MAGNUS (Gm.); Tacz. P. Z. S. 1874, p. 517.

Un mâle de Huambo, tué le 10 mars 1880. Iris brun foncé.

Les œufs, recueillis à Huambo en janvier et en février, sont d'une forme ovée allongée, à sommet plus ou moins aigu, la surface lisse, d'une couleur verte bleuâtre avec une couronne autour du gros bout, composée de veines noires très longues et fines, mélangées avec des plus grosses, entremêlées de différentes manières; dans d'autres les veines sont très fines et plus ou moins courtes, formant une couronne incomplète; sur d'autres la couronne est composée d'un petit nombre de points entremêlés de quelques traits courts. Dimensions: 26·6 × 19 millim. (Scl. et Salv. P. Z. S. 1879, tab, xlii. fig. 9.)

*41. SALTATOR CÆRULESCENS (V.).

Un mâle de Yurimaguas, tué le 22 février 1881. Iris brun foncé.

42. SALTATOR LATICLAVIUS, Scl. et Salv.; Tacz. P. Z. S. 1874, p. 517; 1880, p. 198.

Un mâle de Tamiapampa, tué le 19 novembre 1879.

Cet exemplaire, également comme celui de Cutervo, a la couleur rousse plus repandue sur l'abdomen, et le noir moins prolongé sur le haut de la poitrine que chez les oiseaux du Pérou central.

FRINGILLIDÆ.

*1. GUIRACA CYANEA (L.).

Une paire de Yurimaguas du 10 mars 1881. Iris brun foncé.

*2. ORYZOBORUS TORRIDUS (Gm.).

Un mâle de Yurimaguas, tué le 17 février 1881, est plus petit que les oiseaux de Cayenne et du Brésil, et n'a point de trace du miroir alaire blanc propre à l'espèce. Longueur totale 130, du vol 185, de l'aile 55, de la queue 45, du bec 12 millim. Iris brun foncé.

*3. Spermophila castaneiventris, Cab.

Une femelle tuée à Yurimaguas le 4 mars 1881. Iris brun foncé.

4. Spermophila luctuosa (Lafr.); Tacz. P. Z. S. 1874, p. 519.

Quatre exemplaires des deux sexes de Huambo et de Yurimaguas, tués le 12 mars 1880 et en février 1881. Iris brun foncé.

Les œufs, trouvés à Chirimoto au mois de mars, ressemblent à ceux du Chardonneret par leur forme et le mode de la coloration; le fond est également verdâtre pâle, les taches sont cependant d'une nuance différente, elles ne sont pas rouges mais d'un brun peu foncé; en général elles sont plus grosses, mélangées avec des petites, plus nombreuses près du gros bout en y formant une couronne lache; le petit bout est moins tacheté, ou presque pur. L'éclat à peu près comme dans ceux du Chardonneret. Dimensions: 18 × 12·5, 17·3 × 12·5 millim.

5. Volatinia jacarina (L.); Tacz. P. Z. S. 1874, p. 520; 1880, p. 199.

Une femelle de Chirimoto du 17 août 1880.

6. Phrygilus ocularis, Scl.; Tacz. P. Z. S. 1874, p. 520; 1879, p. 229.

Une femelle de Chachapoyas du 13 septembre 1879.

7. Coturniculus peruanus, Bp.; Tacz. P. Z. S. 1874, p. 521.

Trois exemplaires de Yurimaguas.

8. Chrysomitris capitalis, Cab.; Tacz. P. Z. S. 1874, p. 222; 1879, p. 230.

Un œuf trouvé à Chirimoto, au mois de mars, ressemble par sa forme aux œufs du Chardonneret. Il est blanc pur, parsemé de petites taches et de points rouge-brique, rares sur toute la surface et plus nombreuses autour du gros bout. L'éclat est très faible. Dimensions: 17 × 12·3 millim.

Icteridæ.

Cassicus leucorhamphus, Bp.

Cassiculus chrysonotus, Tacz. P. Z. S. 1874, p. 523.

Trois exemplaires tués à Tamiapampa en novembre 1879. Iris bleu très clair.

Corvidæ.

1. Cyanocitta joliæa, Bp.; Tacz. P. Z. S. 1874, p. 524.

Trois exemplaires de Tamiapampa identiques à celui du Pérou central.

2. Xanthura peruviana (L.); Tacz. P. Z. S. 1874, p. 524; 1879, p. 230.

Trois exemplaires de Huambo et de Chirimoto.

TYRANNIDÆ.

1. MYIOTHERETES STRIATICOLLIS, Scl.; Tacz. P. Z. S. 1874, p. 532.

Un exemplaire tué à Chachapoyas le 13 septembre 1879. Iris brun foncé.

2. OCHTHŒCA THORACICA, Tacz. P. Z. S. 1874, pp. 133, 533; 1879, p. 232.

Cinq exemplaires tués à Tamiapampa en octobre et en novembre 1879.

3. OCHTHŒCA LESSONI, Scl.; Tacz. P. Z. S. 1874, p. 533; 1880, p. 202.

Une femelle de Tamiapampa, tuée le 27 octobre 1879.

4. MECOCERCULUS STICTOPTERUS (Scl.).

Mecocerculus tæniopterus, Cab.; Tacz. P. Z. S. 1874, p. 533.
Ochthœca stictoptera, Tacz. P. Z. S. 1880, p. 202.
Une paire tuée à Tamiapampa en novembre 1879.

5. MUSCISAXICOLA FLUVIATILIS, Scl. et Salv.; Tacz. P. Z. S. 1874, p. 534.

Un exemplaire tué à Huambo le 7 avril 1880.

*6. PLATYRHYNCHUS SENEX, Scl. et Salv. P. Z. S. 1880, p. 156.

Une femelle tuée à Yurimaguas le 22 janvier 1881. Iris brun foncé; pattes carnées claires. Sommet de la tête schistacé foncé avec la huppe interne blanche.

7. TODIROSTRUM CINEREUM (L.); Tacz. P. Z. S. 1874, p. 534; 1880, p. 202.

Un exemplaire de Huambo tué le 19 février 1880. Iris blanc.

8. EUSCARTHMUS PYRRHOPS, Cab.; Tacz. P. Z. S. 1874, p. 535.

Quatre exemplaires des deux sexes de Tamiapampa, tués en novembre 1879.

Les deux sexes ne présentent entre eux aucune différence. Iris d'un brun rougeâtre clair, d'une nuance un peu plus foncée que les plumes du tour de l'œil.

9. ORCHILUS PILEATUS, Tsch.; Tacz. P. Z. S. 1874, p. 535.

Une paire de Huambo du 5 février 1880. Iris brun-noisette clair.

10. COLOPTERUS GALEATUS (Bodd.).

Quatre exemplaires recueillis à Yurimaguas au mois du mars 1881. Iris blanc sale.

*22. ELAINEA PAGANA (Licht.)?

Un mâle tué à Chirimoto le 29 juillet 1880 ressemble en tout aux oiseaux de Cayenne, mais il est beaucoup plus grand, l'aile pliée est plus longue de 10 millim., la queue plus longue de 15 millim.

*23. ELAINEA, sp. inc.

Deux exemplaires tués à Chirimoto le 28 juillet et le 3 août 1880, se distinguent de toutes les formes péruviennes par le disque foncé dans toutes les plumes du sommet de la tête, y formant des squamules bien distinctes, et par la couleur des parties inférieures du corps semblable à celle de l'*E. pagana*, d'un straminé blanchâtre varié comme dans les *Phyllopneuste* de stries irrégulières d'un jaune plus intense. Les dimensions s'accordent avec celles de l'*E. pallatangæ* de M. Sclater: longueur totale 150–153, vol 220–226, aile 70, queue 61, bec 12 millim. Le bec est plus aminci dans sa partie terminale que chez l'*E. albiceps*.

*24. LEGATUS ALBICOLLIS (V.).

Un mâle et une jeune femelle de Huambo, tués le 13 février et le 3 mai 1880, et un mâle de Yurimaguas du 14 mars 1881. Ce dernier ressemble en tout aux oiseaux de Cayenne, tandis que les oiseaux de Huambo se distinguent par la bande sourcilière plus large, entourant tout le sommet de la tête, et les taches foncées des parties inférieures du corps moins développées. Iris brun foncé.

*25. MYIOZETETES GRANADENSIS, Lawr.

Un exemplaire tué à Yurimaguas le 14 mars 1881. Iris gris foncé.

26. RHYNCHOCYCLUS FULVIPECTUS, Scl.; Tacz. P. Z. S. 1874, p. 537.

Un mâle tué à Huambo le 12 mars 1880. Iris brun très foncé.

27. RHYNCHOCYCLUS SULPHURESCENS (Spix); Tacz. P. Z. S. 1877, p. 326.

Un exemplaire de Yurimaguas.

28. RHYNCHOCYCLUS PERUVIANUS, Tacz. P. Z. S. 1874, p. 137.

Sept exemplaires de Huambo, tués en mars 1880.

*29. RHYNCHOCYCLUS MEGACEPHALUS, Scl.

Un exemplaire de Yurimaguas, tué le 20 avril 1881. Iris blanc sale.

*30. PITANGUS SULPHURATUS (L.).

Un exemplaire de Yurimaguas, tué le 22 février 1881. Iris brun foncé.

31. MYIODYNASTES SOLITARIUS (V.); Tacz. P. Z. S. 1874, p. 537.

Deux femelles de Chirimoto, tuées en juillet et en septembre 1880. Iris brun foncé.

*43. Contopus virens (L.).

Six exemplaires tués à Huambo entre le 9 février et le 5 mai 1880. Iris brun foncé.

*44. Contopus borealis (Sw.).

Un jeune mâle de Huambo, tué le 5 mars 1880. Iris brun foncé.

*45. Myiarchus tyrannulus (Müll.).

Un exemplaire tué à Yurimaguas le 14 février 1881. Iris brun foncé.

46. Myiarchus nigriceps, Scl.; Tacz. P. Z. S. 1874, p. 539; 1878, p. 238; 1880, p. 203.

Deux exemplaires de Huambo et de Tamiapampa.

47. Myiarchus cephalotes, Tacz. P. Z. S. 1879, p. 670.

Onze exemplaires des deux sexes de Chirimoto et de Tamiapampa.

48. Tyrannus melancholicus, V.; Tacz. P. Z. S. 1874, p. 539.

Deux exemplaires de Huambo tués en mars 1880. Iris brun foncé.

Les œufs, recueillis à Corral et à Chirimoto en février et en mars, sont ovés, assez courts; à sommet obtus ou faiblement aigu; surface lisse ou médiocrement luisante; le fond est isabelle ou blanchâtre, varié de grosses taches et de points violâtres pâles et d'autres superficielles brunes ou brunes rougeâtres foncées, pour la plupart irrégulières, rares sur la surface et plus nombreuses autour du gros bout. Dimensions: 23·6 × 18·7, 24 × 18·2, 25 × 19·3, 26 × 19·7, 26 × 18·2 millim.

*49. Tyrannus aurantio-atro-cristatus, d'Orb. et Lafr.

Un jeune mâle de Huambo, tué le 5 mars 1880. Iris brun foncé.

Pipridæ.

*1. Piprites chlorion (Cab.).

Trois exemplaires des deux sexes de Huambo et de Yurimaguas, tués en mars 1880 et en mars 1881. Iris brun foncé.

2. Pipra chloromeros, Tsch.; Tacz. P. Z. S. 1874, p. 539.

Huit exemplaires recueillis à Huambo depuis le janvier jusqu'au mai de 1880. Iris blanc chez les adultes et brun foncé chez les jeunes.

*3. Pipra coracina, Scl.

Onze exemplaires des deux sexes de Chirimoto, recueillis en septembre et en juillet 1880. Iris cerise-brunâtre chez le mâle, et terre de Sienne chez la femelle.

4. Pipra leucocilla (L.).

Six exemplaires des deux sexes de Yurimaguas. Iris rouge de cerise.

*5. **Pipra isidori**, Scl.

Huit exemplaires de Huambo recueillis en avril et en mai 1880. Iris brun rougeâtre.

*6. **Pipra virescens**, Pelz.

Un mâle de Yurimaguas tué le 28 février 1881. Iris blanc sale. Cet exemplaire, ainsi que les autres mâles que M. Stolzmann a eu en main, n'ont aucune trace de jaune au sommet de la tête, dont il est mention dans la diagnose de M. Pelzeln.

*7. **Chiromachæris manacus** (L.).

Un mâle de Yurimaguas.

*8. **Machæropterus striolatus**, Bp.

Deux mâles et une femelle, tués à Yurimaguas en février 1881. Iris brun foncé.

*9. **Heteropelma amazonum**, Scl.

Un exemplaire de Yurimaguas, tué le 3 février 1881. Iris brun, un peu plus clair autour de la pupille.

Cotingidæ.

1. **Tityra semifasciata** (Spix); Tacz. P. Z. S. 1874, p. 540.

Trois exemplaires de Huambo, tués en mars 1880. Iris du mâle adulte brun autour de la pupille et d'une nuance plus claire à l'extérieur; brun foncé du jeune mâle.

*2. **Tityra albitorques**, DuBus.

Une femelle tuée à Yurimaguas le 14 mars 1881. Iris brun foncé.

*3. **Hadrostomus minor** (Less.).

Deux femelles de Yurimaguas, tuées en février 1881. Iris brun foncé.

*4. **Pachyrhamphus niger**, Spix.

Une paire de Yurimaguas, tuée le 16 mars 1881. Iris brun foncé.

5. **Pachyrhamphus versicolor**, Hartl.; Tacz. P. Z. S. 1874, p. 540; 1879, p. 236.

Un mâle de Tamiapampa, tué le 5 novembre 1879.

*6. **Pachyrhamphus**, sp. inc.

Deux exemplaires de Yurimaguas tués en mars et en avril 1881.

Forme voisine du *P. albogriseus*, mais bien distincte, moins forte, à ailes plus courtes, bec beaucoup plus long et plus large. Le mâle, dont le sexe est constaté, paraît être jeune et au moment de commencer la mue. Le sommet de la tête est concolore au dos, teint légèrement d'une nuance roussâtre, bordé des deux côtés d'un large sourcil cendré, dont la partie antérieure entre l'œil et le bec est blanchâtre; tout le dessous du corps est jaunâtre pâle; les bordures des plumes alaires sont d'un ocreux très pâle et presque blanches sur quelques-unes des plumes; la queue est semblable à celle du *P. albogriseus.* Iris brun très foncé. La femelle a le roux du sommet de la tête d'une nuance différente de celle de la femelle du *P. albogriseus*, sans aucune trace de la bande latérale noire; les bordures des plumes alaires sont d'un roux beaucoup plus intense que chez le mâle, ainsi que les taches terminales des rectrices.

♂. Longueur totale 150, vol 212, aile 64, bec 20 millim. ♀. Longueur totale 145, vol 210, aile 63, bec 21 millim.

7. LIPAUGUS SIMPLEX (Licht.); Tacz. P. Z. S. 1874, p. 540.

Quatre exemplaires de Huambo et de Yurimaguas, recueillis en février 1881. Iris brun foncé.

8. RUPICOLA PERUVIANA (Lath.); Tacz. P. Z. S. 1874, p. 540.

Un mâle adulte de Huambo.

*9. PIPREOLA RIEFFERI, Boiss.

Trois exemplaires recueillis à Tamiapampa en octobre et en novembre 1879. Iris brun foncé.

*10. PIPREOLA AUREIPECTUS, Lafr.

Un mâle tué le 23 août 1880 à Achamal. Iris jaune.

11. AMPELIO ARCUATUS (Lafr.); Tacz. P. Z. S. 1874, p. 540.

Un exemplaire de Chachapoyas.

12. HELIOCHERA RUFAXILLA, Tsch.; Tacz. P. Z. S. 1879, p. 237.

Trois exemplaires des deux sexes recueillis à Tamiapampa en octobre et en novembre 1879. Iris rouge.

*13. COTINGA MAYNANA (L.).

Deux mâles et deux femelles, tués à Yurimaguas en février et en mars 1881. Iris ocreux.

*14. LAMPROTES ALBOCRISTATUS, Lafr.

Un mâle tué à Tamiapampa le 6 novembre 1879. Iris brun foncé.

Selon l'opinion de M. Stolzmann, cet oiseau n'a rien de commun avec les Tanagrides; ses habitudes indiquent son affinité aux oiseaux de la famille des Cotingides. C'était aussi l'opinion de Jules Verreaux.

*15. JODOPLEURA ISABELLÆ (Parz.).

Un mâle tué à Yurimaguas le 7 février 1881. Iris brun très foncé.

16. CEPHALOPTERUS ORNATUS, Geoff.; Tacz. P. Z. S. 1874, p. 521.

Un mâle et deux femelles de Huambo.

DENDROCOLAPTIDÆ.

*1. **SYNALLAXIS ALBESCENS**, Temm.

Un mâle tué à Yurimaguas le 22 février 1881. Iris brun.

*2. **SYNALLAXIS CISANDINA**, Stolzm. MS.

S. *supra ex olivaceo fusca, subtus dilutior; pileo toto, alis extus et cauda rufis; superciliis postocularibus griseo-albidis; gula albida; tectricibus alarum inferioribus remigibusque intus ochraceis.*

♂ ad. D'un gris olivâtre foncé en dessus, d'une nuance beaucoup plus pâle en dessous; à sommet de la tête roux en entier, tirant au front en grisâtre dans certaines directions de la lumière; un sourcil gris blanchâtre ou cendré assez large derrière l'œil et à peine distinct sur le devant; gorge blanchâtre, légèrement nébulée de gris. Ailes rousses extérieurement, à rémiges intérieurement brunes bordées de roussâtre, sous-alaires ocreuses. Queue à 12 rectrices d'un roux un peu plus foncé que l'aile. Bec corné noirâtre à mandibule carnée pâle; pattes grises olives; iris terre de Sienne.

♀. La femelle ne diffère en rien.

♂. Longueur totale 178, vol 230, aile 70, queue 71, bec 18, tarse 20 millim. ♀. Longueur totale 170, vol 218, aile 65, queue 70, bec 19, tarse 20 millim.

Forme intermédiaire entre la *S. antisiensis* et la *S. curtata*, distincte de la première par une taille moins forte, la couleur du dos moins grise, celle des parties inférieures du corps plus foncée, surtout sur la poitrine, le sourcil moins prononcé, la couleur rousse de la tête, des ailes et de la queue relativement plus foncée.

De la *S. curtata* elle diffère par la couleur rousse occupant le front, et d'une nuance un peu plus foncée, ainsi que celle des ailes et de la queue; la couleur du dos est plus roussâtre dans la *S. curtata*.

Trois exemplaires tués à Chirimoto et à Huambo en août et en février 1880.

*3. **SYNALLAXIS FURCATA**, Stolzm. MS.

S. *supra olivaceo-grisea, subtus ochracea; pileo, alis extus et cauda rufis; superciliis latis postocularibus ochraceis; tectricibus alarum inferioribus remigibusque intus ochraceo-cinnamomeis.*

♀. D'un gris brunâtre en dessus, d'un ocreux en dessous; à sommet de la tête roux, tirant au jaunâtre sur le front et passant insensiblement sur la nuque en couleur dorsale; bordé des deux côtés par une large bande sourcilière postoculaire ocreuse; une raie rousse foncée derrière l'œil. Les ailes rousses extérieurement, à tectrices inférieures et le bord interne des rémiges ocreux. Queue à 12 rectrices, rousse, un peu plus rougeâtre que l'aile; les sous-caudales ocreuses sales, les tectrices supérieures de la queue rousses. Mâchoire noire cornée; mandibule blanche d'ivoire avec l'extrémité grise foncée; pattes grises olives, avec les bordures jaunes sur les scutelles; iris gris.

Longueur totale 174, vol 224, aile 69, queue 65, bec 18, tarse 19 millim.

L'oiseau en premier plumage a la couleur des parties supérieures du corps plus foncée, le sommet de la tête concolore au dos, le dessous du corps fauve, avec les flancs de l'abdomen largement gris; bande sourcilière fauve. Ailes et queue comme dans l'adulte. Il a déja quelques plumes rousses sur le milieu de la nuque, et plusieurs ocreuses sur la gorge et la poitrine.

Ces deux exemplaires ont été tués à Chirimoto (5400′), la femelle le 21 juillet, le jeune le 13 août 1880, sur les arbres peu élevés, dans les conditions sembables à celles de la *S. antisiensis*. C'est une forme voisine de cette dernière.

*4. SYNALLAXIS HYPOSTICTA, Scl.

Un mâle tué à Yurimaguas le 9 mars 1881. Iris ocreux.

*5. SYNALLAXIS RUTILANS, Temm.

Deux exemplaires de Yurimaguas, tués le 18 février et le 1 mars 1881. Iris brun foncé.

6. SYNALLAXIS FRUTICICOLA, Stolz.; Tacz. P. Z. S. 1879, p. 670, 1880, p. 200.

Les œufs de cette espèce, recueillis à Corral en février, sont d'un blanc légèrement verdâtre. Dimensions: 20 × 15·8; 20·4 × 16; 20·7 × 16; 22 × 16·4 millim.

*7. ANCISTROPS LINEATICEPS, Scl.

Trois exemplaires de Yurimaguas tués le 1 et 4 février 1871. Iris brun foncé.

*8. AUTOMOLUS SCLATERI, Pelz.

Trois exemplaires de Yurimaguas tués en janvier 1881. Iris brun foncé.

*9. PHILYDOR ERYTHROPTERUS, Scl.

Deux exemplaires tués à Yurimaguas en février 1881. Iris brun foncé.

10. IPOBORUS STICTOPTILUS, Cab.; Tacz. P. Z. S. 1874, p. 528.

Un mâle tué à Yurimaguas le 1 février 1881 a le bec un peu plus long et l'abdomen un peu plus foncé que l'exemplaire typique. Iris brun foncé.

11. ANABAZENOPS CABANISI, Tacz. P. Z. S. 1874, p. 529; 1879, p. 231.

Deux exemplaires de Cococho et d'Achamal tués en septembre 1880.

12. XENOPS RUTILUS, Licht.; Tacz. P. Z. S. 1874; p. 529; 1879, p. 231.

Cinq exemplaires de Chirimoto, Cococho et Huambo.

13. **Xenops littoralis**, Scl.; Tacz. P. Z. S. 1874, p. 259.

Un exemplaire de Yurimaguas.

14. **Sittasomus olivaceus** (Wied); Tacz. P. Z. S. 1874, p. 529; 1877, p. 323.

Deux exemplaires tués à Yurimaguas en février 1881.

15. **Margarornis squamigera** (d'Orb. et Lafr.); Tacz. P. Z. S. 1874, p. 529; 1880, p. 201.

Un exemplaire de Tamiapampa du 11 novembre 1879. Iris brun foncé.

*16. **Margarornis brunnescens**, Scl.

Deux exemplaires de Huambo, dont le mâle adulte est pris le 6 avril, et un jeune le 30 janvier 1880. Iris brun foncé.

Cet oiseau est très mal placé dans le genre. Son bec est tout à fait différent de celui de l'espèce typique; la proportion du doigt médian aux latéraux est autre; les ailes sont beaucoup plus courtes, etc. Selon les observations de M. Stolzmann, il diffère encore plus par ses habitudes: tandis que le *M. squamigera* grimpe continuellement à la manière des *Xenops* et des Grimpereaux, le *M. brunnescens* sautille sans cesse sur les branches des petits buissons tout près de terre.

*17. **Glyphorhynchus cuneatus** (Licht.).

Quatre exemplaires de Yurimaguas, tués en février 1881. Iris brun foncé.

*18. **Dendrocincla fumigata** (Licht.).

Deux exemplaires tués à Huambo en février 1880. Iris gris foncé.

*19. **Dendrornis triangularis** (Lafr.).

Un exemplaire de Ray-urmana (7500′) tué le 17 juillet 1880. Iris brun foncé.

*20. **Dendrornis rostripallens** (Des Murs).

Deux exemplaires de Yurimaguas, tués en janvier 1881. Iris brun-foncé.

21. **Dendrornis chunchotambo** (Tsch.); Tacz. P. Z. S. 1874, p. 529.

Six exemplaires de Huambo et de Chirimoto.

*22. **Dendrornis elegans**, Pelz.

Un exemplaire de Yurimaguas, tué le 1 février 1881. Iris brun foncé.

23. **Xiphocolaptes compressirostris**, n. sp.

X. promeropirhynchus?, Tacz. P. Z. S. 1879, p. 231.

Un exemplaire, pris par M. Stolzmann à Ray-urmana le 29 septembre 1880, s'accorde en tout avec celui de Tambillo, dont j'ai donné la description dans la liste de 1879, et diffère également des oiseaux de la Nouvelle Grénade, ce qui me décide à lui proposer le nom spécifique et la diagnose suivante :—

X. promeropirhyncho *simillimus, sed rostro breviore, compressiore et pallido ; striis fulvis pilei et colli postici strictioribus ; dorso unicolori ; gula fulva, binis vittis brunneis longitudinalibus ; abdomine medio latissime ochraceo, nigro maculato ; striis pectoralibus lineis nigricantibus marginatis ; subcaudalibus brunneo-ferrugineis, nigro variis ; alis caudaque obscurioribus.*

La mâchoire est grise cornée, plus foncée à l'extrémité, plus claire sur les bords ; mandibule grise cornée noirâtre à l'extrémité, passant graduellement en gris plombé vers la base ; pattes plombées olivâtres ; iris brun foncé.

Cet exemplaire présente les dimensions suivantes : ♂. longueur totale 342, vol 458, aile 143, queue 135, bec 51, tarse 31, hauteur du bec vis à vis les narines 12 millim.

24. **Picolaptes peruvianus**, n. sp.

P. lacrymiger, Tacz. P. Z. S. 1874, p. 529 ; 1879, p. 232 ; 1880, p. 201.

Un mâle recueilli à Tamiapampa le 22 novembre 1879.

Tous les exemplaires de cette forme, que j'ai vu en grand nombre des différentes localités du Pérou central et septentrional, se ressemblent dans tous les détails, et se distinguent constamment des oiseaux de la Colombie ; ils paraissent donc constituer une forme différente, fort répandue au Pérou. La différence principale consiste dans la forme des taches sur les parties inférieures du corps, qui au lieu d'être lacrymiformes, c'est à dire distinctement élargies et obtuses à l'extrémité, comme dans l'espèce citée, sont graduellement atténuées vers l'extrémité et plus ou moins aiguës ; la gorge est unicolore et fauve, au lieu de blanche, distinctement squamulée chez les oiseaux de Colombie ; la présence des stries dorsales très fines, dont il n'y a pas de trace chez le *P. lacrymiger* ; la nuance du fond de la poitrine et de l'abdomen est distinctement plus pâle dans ces oiseaux péruviens, etc. Je propose donc le nom spécifique et la diagnose suivante pour cette forme péruvienne.

P. *supra olivaceo-rufus, pileo obscuriore ; uropygio, alis caudaque cinnamomeis ; pileo usque ad nucham maculis minimis subtriangularibus, pallide fulvis, nigro terminatis notato ; gutture fulvo immaculato ; capitis lateribus superciliisque albidis brunneo striatis ; pectoris abdominisque plumis rufo-olivaceis striga mediana oblonga fulva aut albida, apice plus aut minus acuta, nigro marginata notatis.*

♂. Longueur de l'aile 112, queue 100, bec 30, tarse 21 millim.

♀. Longueur de l'aile 108, queue 99, bec 29, tarse 21 millim.

Huit exemplaires des deux sexes de Chachapoyas, de Chirimoto et de Tamiapampa, recueillis en septembre et en novembre 1880.

*4. PYGOPTILA MACULIPENNIS, Scl.

Un mâle de Yurimaguas, du 15 janvier 1881. Iris brun foncé.

5. DYSITHAMNUS SEMICINEREUS, Scl.; Tacz. P. Z. S. 1874, p. 350.

Nombreux exemplaires des deux sexes de Cococho, Huambo et Chirimoto.

*6. THAMNOMANES GLAUCUS, Cab.

Trois exemplaires de Yurimaguas recueillis en février 1881. Iris brun foncé.

*7. MYRMOTHERULA SURINAMENSIS (Gm.).

Deux mâles de Huambo, tués en mars et en avril 1880. Iris brun foncé.

*8. MYRMOTHERULA PYGMÆA (Gm.).

Deux exemplaires de Yurimaguas, tués en janvier et février 1881. Iris brun foncé.

*9. MYRMOTHERULA GUTTURALIS, Scl. et Salv.

Trois exemplaires de Huambo, tués en mars 1881. Iris gris clair.

*10. MYRMOTHERULA HÆMATONOTA, Scl.

Quatre oiseaux des deux sexes, tués à Yurimaguas en février et en mars 1881. Iris brun clair chez le mâle, et gris pâle chez la femelle.

11. MYRMOTHERULA ATROGULARIS, Tacz. P. Z. S. 1874, pp. 137 et 530.

Sept exemplaires de Huambo, tués en février et en mars 1880. Iris brun rougeâtre foncé.

12. MYRMOTHERULA MENETRIESI, d'Orb.; Tacz. P. Z. S. 1874, p. 530.

Six exemplaires tués à Huambo en février et en mars 1880. Iris brun foncé.

*13. MYRMOTHERULA AXILLARIS (V.).

Deux exemplaires de Yurimaguas, tués en janvier 1881. Iris brun foncé.

*14. MYRMOTHERULA CINEREIVENTRIS, Scl.

Six exemplaires des deux sexes tués à Yurimaguas en janvier et en février 1881. Iris brun foncé.

*15. HERPSILOCHMUS PUNCTICEPS, n. sp.

H. *supra cinereo-olivaceus, subtus pallide sulphureus; pileo nigro albo maculato; gula fusco subsquamulata; hypochondriis oliva-*

ceo lavatis; alis nigricantibus, tectricibus flavido limbatis, remigibus externe colore dorsi marginatis; rectricibus mediis cinereis, externis fere totis albis, reliquis nigris albo terminatis. Rostrum nigrum, mandibula grisea; pedes cinereo-plumbei; iris grisea.

Mâle adulte d'un cendré olivâtre en dessus, à sommet de la tête noir maculé de nombreuses taches subtriangulaires blanches, le plus denses au milieu et en arrière des yeux, petites au front, et presque nulles sur la région sourcilière; tout le dessous est jaune souffre pâle, plus pâle sur la gorge et squamulé de noirâtre, lavé d'olivâtre sur les flancs et le haut de la poitrine; joues jaunâtres variées de noir. Ailes noirâtres, à tectrices bordées à l'extrémité de jaunâtre; les bordures externes des rémiges fines de la couleur du dos, et celles des primaires jaunâtres pâles; les sous-alaires jaunes à peu près comme l'abdomen; le bord interne des rémiges d'un jaune plus pâle. Les deux rectrices externes blanches presque en entier, les autres noires terminées de blanc, de plus en plus moins en avançant vers le submédiaires, les deux médianes cendrées en entier. Mâchoire noire; mandibule grise; pattes cendrées plombées; iris gris.

La femelle sembable au mâle, et distincte par le sommet de la tête largement roussâtre et immaculé, exceptée la région sourcilière, qui est grise avec les taches blanchâtres oblongues, analogues à celles du mâle; la gorge est squamulée de foncé; les tectrices alaires beaucoups moins foncées, avec les bordures pareilles à celles du mâle.

Le jeune mâle se distingue de l'adulte par le sommet de la tête roussâtre en grande partie avec des taches d'un blanc jaunâtre, plus grosses que celles de l'adulte; le fond du dos est plus olive; les tectrices alaires comme chez la femelle.

♂. Longueur totale 145, vol 182, aile 55, queue 49, bec 17, tarse 17 millim.

Trois exemplaires de Huambo, tués en février et en mars 1880.

*16. Rhamphocænus melanurus, V.

Un exemplaire de Yurimaguas, tué le 20 janvier 1881. Iris gris.

17. Cercomacra tyrannina, Scl.; Tacz. P. Z. S. 1877, p. 530.

Sept exemplaires des deux sexes de Huambo et de Chirimoto, tués en mars, mai et avril 1880. Iris brun très foncé.

*18. Cercomacra cinerascens, Scl.

Un exemplaire de Yurimaguas, tué le 25 février 1881. Iris gris.

*19. Percnostola fortis, Scl. et Salv.

Une femelle de Yurimaguas, tuée le 15 mars 1881. Iris brun.

20. Myrmeciza hemimelæna, Scl. et Salv.; Tacz. P. Z. S. 1874, p. 530.

Quatre exemplaires de Huambo, recueillis en avril 1880. Iris brun foncé.

*21. Myrmeciza maynana, n. sp.

M. fumosa; gula, pectore, abdomine medio, alis caudaque nigris; tectricibus alarum maculis albis triangularibus variis. Rostrum nigrum; pedes plumbei; iris fusco-brunnea.

Mâle adulte voisin de la *M. atrothorax*, mais parfaitement distinct par la couleur générale plus uniforme, celle des parties supérieures du corps d'un fuligineux à peine lavé de brunâtre; la couleur du dessous beaucoup plus foncée que dans l'espèce citée, et en conséquence le noir de la portrine paraît être moins distinct du fuligineux de l'abdomen, tant plus que le noirâtre passe le long du milieu de cette partie. Les tectrices alaires sont noires, terminées chacune par une tache triangulaire blanche; rémiges noirâtres sans bordure brune; sous-alaires noirâtres variées de quelques taches blanches. Queue noire. Les plumes du milieu du dos blanches à la base. Bec noir; pattes plombées; iris brun foncé.

Longueur totale 160, vol 200, aile 58, queue 55, bec 20, tarse 26 millim.

Un exemplaire de Yurimaguas.

*22. Hypocnemis cantator (Bodd.).

Quatre exemplaires de Yurimaguas, tués en janvier et en mars 1881. Iris brun foncé.

23. Hypocnemis myiotherina (Spix); Tacz. P. Z. S. 1874, p. 531.

Cinq exemplaires des deux sexes de Yurimaguas, recueillis en janvier et en février 1881. Iris brun foncé.

24. Hypocnemis pœcilonota, Pucher.; Tacz. P. Z. S. 1874, p. 531.

Une paire de Huambo recueillie en février et en avril 1881. Iris brun-foncé.

25. Hypocnemis theresæ (Des Murs); Tacz. P. Z. S. 1874, p. 531.

Quatre exemplaires de Huambo et de Yurimaguas, recueillis en février 1880 et de 1881. Iris gris foncé chez le mâle, et moins foncé dans la femelle.

*26. Pithys lunulata, Scl. et Salv.

Une femelle de Yurimaguas, tuée le 18 février 1881. Iris gris très foncé.

*27. Formicarius analis (d'Orb. et Lafr.).

Une femelle tuée à Huambo le 3 février 1880. Iris brun foncé.

*28. Formicarius nigrifrons, Gould.

Une femelle de Yurimaguas, tuée le 20 avril 1881. Iris brun foncé.

moins forte que chez l'espèce citée; les bordures internes des miges à peine roussâtres. Bec noir corné, à mandibule blan d'ivoire avec l'extrémité et les bords gris cornés foncés; pattes gri iris brun très foncé.

♂. Longueur totale 170–175, vol 282, aile 84, queue 33, 24, tarse 40, doigt médian avec l'ongle 26 millim. ♀. Longu totale 165, vol 270, aile 80, queue 33, bec 23·5, tarse 39, d médian avec l'ongle 26 millim.

Deux mâles et une femelle de Yurimaguas, tués en février 188

32. Conopophaga ardesiaca, d'Orb. et Lafr.; Tacz. P. Z 1874, p. 531.

Un mâle tué à Huambo le 28 avril 1880. Iris brun foncé.

33. Corythopis anthoides (Cuv.)

Six exemplaires de Huambo et de Yurimaguas.

Pteroptochidæ.

*Scytalopus, sp. inc.

Un jeune oiseau en premier plumage de Chirimoto.

Trochilidæ.

*1. Glaucis hirsuta (Gm.).

Un jeune oiseau de Yurimaguas.

2. Phaethornis superciliosus (L.).

Ph. malaris, Tacz. P. Z. S. 1874, p. 541.
Un mâle de Yurimaguas du 2 février 1881.

3. Phaethornis guyi (Less.); Tacz. P. Z. S. 1874, p. 541.

Sept exemplaires de Huambo recueillis depuis le 30 mars jusqu 1 mai.

*4. Phaethornis hispidus, Gould.

Une femelle tuée à Yurimaguas le 10 mars 1881.

*5. Phaethornis nigricinctus (Lawr.).

Un mâle de Yurimaguas du 21 février 1881.

*6. Phaethornis bourcieri (Less.).

Un mâle tué à Yurimaguas le 25 février 1881.

7. Aphantochroa hyposticta, Gould: Tacz. P Z. S. 18 p. 545.

Deux paires de Huambo, recueillies en mars et en mai 1880.

*8. Doryphora johannæ (Bourc.).

Quatre exemplaires tués à Huambo en avril et en mai 1880.

[illegible] page inférieure de la [illegible] pattes brunes noirâtres ;

31. **Docimastes ensifer** (Boiss.); Tacz. P. Z. S. 1874, p. 543 1880, p. 204.

Une femelle tuée à Tamiapampa le 16 novembre 1879.

32. **Heliotrypha viola**, Gould; Tacz. P. Z. S. 1879, p. 238 1860, p. 205.

Cinq exemplaires tués à Chachapoyas et à Tamiapampa en octobr et en novembre 1879.

*33. **Diphlogæna iris** (Gould).

Quatre mâles et trois femelles recueillis à Chachapoyas et à Tamiapampa en octobre et en novembre 1879, comparés par M. Salvin avec l'exemplaire typique.

Nos mâles présentent quelques légères différences avec la description dans l'ouvrage de Mulsant, et principalement en ce que le devant du dos et les tectrices alaires ne sont pas vertes, mais d'un bronzé antique sombre, lustré de rougeâtre dans certaines directions de la lumière et passant au noir velouté dans les autres; la tache jugulaire, composée de trois ou de quatre plumes, n'est pas bleue, mais d'un lilas clair, conservant sa teinte dans toutes les directions.

La femelle diffère du mâle par les plumes du sommet de la tête moins longues que chez le mâle, en constituant la surface distinctement squamuleuse, à couleur verte foncée sur le devant du front, passant ensuite en vert doré, puis graduellement en orangé et au rouge de feu, beaucoup moins fort que chez le mâle; la tache occipitale est réduite à quelques petites plumes bleues sur la ligne médiane; la partie cervicale est couverte de plumes squamiformes d'un rouge rubiné avec un éclat assez fort; le vert de la gorge moins luisant et passant au bleuâtre sous certain jour; point de gorgerette; les plumes du haut de la poitrine frangées de fauve; la couleur cannelle de l'abdomen moins foncée; rectrices bordées à l'extrémité de bronzé foncé; le reste comme dans le mâle.

Une femelle moins adulte a la couleur rousse généralement plus pâle; les plumes de la gorge, des côtés du visage et de tout le devant du cou isabelles à la base et une bordure terminale, ce qui forme des taches vertes plus ou moins isolées sur un fond clair; les bordures terminales des rectrices plus larges; la couleur cuivreuse rougeâtre du dos ne changeant pas en noir velouté.

Un mâle, probablement incomplètement adulte, a les petites et les moyennes tectrices alaires en grande partie d'un cannelle plus intense que sur les autres parties du corps; cet individu n'a aucune trace de la gorgerette lilacée.

34. **Bourcieria insectivora** (Tsch.): Tacz. P. Z. S. 1874, p. 543.

Un mâle tué à Huambo le 1 mai 1880.

*35. **Heliomaster longirostris** (V.)

Un mâle de Yurimaguas tué le 17 février 1881.

*41. CHRYSURONIA JOSEPHINÆ (Bourc. et Muls.).

Six exemplaires des deux sexes recueillis à Huambo au mois de mars et en avril 1880.

*42. EUCEPHALA CÆRULEA (V.).

Un exemplaire, probablement femelle, tuée à Yurimaguas le 20 avril 1881.

43. CHLOROSTILBON BREVICAUDATUS, Gould; Tacz. P. Z. S. 1874, p. 545.

Mâle adulte et un jeune mâle de Huambo et d'Achamal tués en mai et en août 1880.

CYPSELIDÆ.

*1. CYPSELUS MONTIVAGUS, d'Orb. et Lafr.

Un exemplaire de Huambo du 18 mars 1880. Iris brun très foncé.

2. CHÆTURA RUTILA (V.); Tacz. P. Z. S. 1874, p. 545.

Un exemplaire de Chirimoto.

CAPRIMULGIDÆ.

*1. ANTROSTOMUS RUFUS (Gm.).

Un mâle, tué entre Chirimoto et Achamal le 7 août 1880. Iris noir.

*2. ANTROSTOMUS NIGRESCENS, Cab.

Un exemplaire de Huambo, tué le 2 avril 1880. Iris noir.

3. NYCTIDROMUS ALBICOLLIS (Gm.); Tacz. P. Z. S. 1877, p. 327; 1879, p. 240.

Quatre exemplaires des deux sexes de Chirimoto.

STEATORNITHIDÆ.

1. STEATORNIS CARIPENSIS, Humb.; Tacz. P. Z. S. 1880, p. 208.

Deux exemplaires, tués à Huambo en février 1880.

PICIDÆ.

*1. PICUMNUS STEINDACHNERI, n. sp. (Plate II. figs. 1 ♂, 2 ♀.)

P. *supra griseus albido squamulatus; capite nigro, supra albo punctato; fronte et vertice rubro striatis; margine frontali tectricibusque narium albidis; gula albida; pectore abdomineque nigris albo striatis, ventre nigro alboque transfasciato; alis griseo-brunneis; remigibus secundariis albido marginatis; cauda nigra, rectricum mediarum pogonio interno et vitta mediana obliqua binarum utrinque externarum albis. Fem. mari similis, pileo toto nigro albo punctato.*

Le mâle adulte est d'un gris cendré en dessus, à plumes terminées

bordure blanchâtre et précédée d'une petite tache centrale
re sur celles de la région interscapulaire; sommet et côtés de la
irs, à plumes frontales et celles du vertex terminées de rouge
é foncé, en formant un grand espace rouge mélangé de noir,
e du sommet et le haut des côtés de la tête variés de points
; les tectrices nasales et la bordure frontale blanchâtres;
es auriculaires d'un noir brunâtre. Gorge blanchâtre sale;
e et le devant de l'abdomen noirs variés de stries blanches
nt le milieu même de chaque plume, un peu plus larges sur la
re, et plus fines au milieu du dernier; flancs de l'abdomen et
-ventre rayés à travers de noir et de blanc; sous-caudales
es entourées d'une bordure noire. Ailes brunes grisâtres, à
es finement bordées de blanchâtre; les rémiges secondaires
s extérieurement de blanchâtre en formant une large raie
dinale sur chacune des ailes pliées; sous-alaires blanches,
ue le bord interne de toutes les rémiges. Queue noire, à
interne blanche dans toute la longueur des rectrices médianes,
large raie oblique de la même couleur sur le milieu des deux
es latérales de chaque côté de la queue. Bec noirâtre, cendré
sous des narines, à mandibule grise terminée de noir; pattes
; iris brun foncé.

emelle est semblable au mâle et ne diffère que par le sommet
ête tout noir ponctué de blanc.

femelle, probablement moins adulte, a seulement la poitrine
e variée de grosses gouttes blanches, tout l'abdomen rayé
ic et de noir.

Longueur totale 112–113, vol 195–202, aile 56, queue 33,
, tarse 12, doigt médian avec l'ongle 15 mill. ♀. Longueur
111–113, vol 195–200, aile 57–59, queue 33, bec 13·5–14,
1·5–12, doigt médian avec l'ongle 15 mill.

tre mâles et deux femelles de Chirimoto recueillis en juillet,
l et en septembre 1880.

édie cette intéressante espèce à mon ami M. le docteur Stein-
r, savant directeur du Musée de Vienne.

mi les oiseaux fournis précédemment par M. Jelski du
central il y a un mâle de *Picumnus* que j'ai pris pour un
squamatus, mais qui est très voisin du précédent et distinct
dernier par la couleur différente des parties inférieures du
t celle de la bordure frontale et des tectrices nasales. Comme
inédit, je donne sa description en lui proposant le nom du
ur qui a tant enrichi la connaissance de la faune péruvienne.

ICUMNUS JELSKII, n. sp. (Plate II. fig. 3.)

upra griseus, minime albido squamulatus, striis fuscis indi-
incte varius; pileo nigro, fronte verticeque cinnabarino striatis,
rvice nuchaque albo punctatis; margine frontali tectrici-
usque narium ochraceis; gula sordide albida; pectore abdo-
ineque albidis nigro maculatis; alis griseo-brunneis; remigibus
cundariis albido marginatis; cauda nigra, pogonio interno

rectricum medianarum et vitta mediana obliqua externarum utrinque binarum albis.

Le mâle adulte est d'un gris cendré en dessus, à bordures des plumes d'un gris plus clair moins prononcées que dans le précédent, avec des stries noirâtres au milieu des plumes peu distinctes; sommet de la tête noir, à plumes frontales et celles du vertex terminées longuement de rouge cinabre, formant un espace aussi vaste comme dans l'espèce précédente, mais d'une nuance un peu plus foncé; les tectrices nasales et la bordure antérieure du front ocreuses; région auriculaire gris brunâtre. Gorge blanchâtre sale; le reste des parties inférieures du corps est blanchâtre, lavé légèrement de jaunâtre et varié de taches noires, dont celles de la poitrine sont plus ou moins élargies en bandes transversales, celles des flancs de l'abdomen subcordiformes et plus grosses qu'au milieu de cette partie; sous-caudales blanchâtres avec une ou deux taches centrales noires. Ailes brunes grisâtres, à tectrices bordées finement de gris clair; les rémiges secondaires bordées extérieurement de blanchâtre en formant sur l'aile pliée une large bande de cette couleur, semblable à celle de l'espèce précédente; sous-alaires blanches ainsi que le bord interne de toutes les rémiges. Queue noire à barbe interne blanche dans toute la longueur des rectrices médianes, et une large raie oblique de la même couleur sur le milieu des deux rectrices latérales de chaque côté de la queue. Bec noirâtre, à base de la mâchoire cendrée sur les côtés; la mandibule cendrée à la base, jaunâtre au milieu et noirâtre au bout; pattes grises; iris brun foncé.

Longueur de l'aile 59, queue 31, bec 14, tarse 12, doigt médian avec l'ongle 15 mill.

Paltaypampa dans la vallée de Chanchamayo au Pérou central.

3. **Picumnus aurifrons**, Pelz.; Tacz. P. Z. S. 1874, p. 546.

Cinq exemplaires recueillis à Huambo en mars et en avril 1880.

4. **Campephilus hæmatogaster**, Tsch.; Tacz. P. Z. S. 1874, p. 546.

Trois exemplaires de Huambo et de Ray-urmana, recueillis en mars et en septembre 1880. Iris brun foncé.

5. **Dryocopus lineatus** (L.); Tacz. P. Z. S. 1874, p. 546.

Une paire de Huambo, tuée en février et en avril 1880. Iris blanc.

6. **Chloronerpes hæmatostigma** (Natt.); Tacz. P. Z. S. 1874, p. 546.

Une paire de Yurimaguas, tuée en février 1881. Iris brun foncé.

*7. **Chloronerpes flavigula** (Bodd.).

Une femelle de Yurimaguas.

8. **Chrysoptilus atricollis**, Malh.; Tacz. P. Z. S. 1880, p. 209.

Un mâle tué à Chachapoyas le 25 septembre 1879. Iris brun foncé.

9. MELANERPES CRUENTATUS (Bodd.).

Melanerpes hirundinaceus, Tacz. P. Z. S. 1874, p. 546.

Deux mâles et une femelle tués à Yurimaguas en janvier et en mars 1881. Iris jaune.

10. HYPOXANTHUS BREVIROSTRIS, Tacz. P. Z. S. 1874, p. 546, 1880, p. 209.

Un mâle de Tamiapampa.

*11. CELEUS JUMANA (Spix).

Une paire de Yurimaguas, tuée en janvier et en mars 1881. Iris brun rougeâtre foncé.

*12. CELEUS GRAMMICUS (Malh.).

Un mâle tué à Yurimaguas le 20 janvier 1881. Iris brun rougeâtre foncé.

MOMOTIDÆ.

MOMOTUS BRASILIENSIS, Lath.

Un exemplaire de Yurimaguas, tué le 15 mars 1881. Iris brun.

TROGONIDÆ.

*1. TROGON VIRIDIS, L.

Deux mâles recueillis à Huambo le 4 février et le 3 mai 1880. Iris brun foncé. Dans le vivant la bordure de la paupière est d'un blanc bleuâtre; bec blanc bleuâtre sale, avec une bande transversale noire voisine de l'extrémité de la mâchoire; pattes plombées.

*2. TROGON ATRICOLLIS, V.

Un mâle de Yurimaguas tué le 8 mars 1881. Iris brun très foncé. Dans le vivant bec et le tour de la paupière olives pâles; pattes grises.

3. TROGON COLLARIS, V.; Tacz. P. Z. S. 1874, p. 547; 1880, p. 210.

Un mâle de Huambo, tué le 1 avril 1880. Iris brun foncé; bec jaune de cire; pattes grises.

4. TROGON HELIOTHRIX, Tsch.; Tacz. P. Z. S. 1874, p. 547.

Six exemplaires des deux sexes recueillis à Tamiapampa en octobre 1880. Iris brun foncé.

GALBULIDÆ.

*1. GALBULA ALBIROSTRIS (Lath.).

Une paire recueillie à Yurimaguas le 22 janvier et le 28 février 1880. Iris brun foncé.

*2. UROGALBA AMAZONUM, Scl.

Une femelle de Yurimaguas, tuée le 17 février 1881. Iris brun foncé.

*3. JACAMEROPS GRANDIS (Gm.).

Une femelle de Yurimaguas, tuée le 3 février 1881. Iris brun très foncé.

BUCCONIDÆ.

*1. BUCCO PICATUS, Scl.

Un exemplaire sans indication de sexe de Yurimaguas, tué le 8 février 1881. Iris brun très foncé.

*2. BUCCO MACRODACTYLUS, Spix.

Un exemplaire de Yurimaguas, tué le 15 janvier 1881. Iris rouge de cerise.

3. MALACOPTILA RUFA (Spix).

Un mâle de Yurimaguas, tué le 22 janvier 1881. Iris brun rougeâtre.

*4. MALACOPTILA FUSCA (Gm.).

Un mâle de Huambo tué le 8 avril 1880. Iris brun foncé.

*5. NONNULA BRUNNEA, Scl. Ibis, 1881, p. 600.

Une femelle de Yurimaguas, tuée le 2 février 1881. Iris brun foncé.

6. MONASA PERUANA, Bp.; Tacz. P. Z. S. 1874, p. 548.

Deux femelles tuées à Yurimaguas en janvier et en février 1881. Iris gris très foncé.

*7. CHELIDOPTERA TENEBROSA (Pall.).

Une paire de Yurimaguas tuée en janvier et en février 1881. Iris brun foncé.

CUCULIDÆ.

1. PIAYA NIGRICRISSA, Scl. P. Z. S. 1874, p. 548, 1879, p. 240.

Un exemplaire de Yurimaguas du 13 mars 1881. Iris rouge cerise.

*2. PIAYA MELANOGASTRA (V.).

Un exemplaire de Yurimaguas tué le 22 janvier 1881. Iris brun foncé.

RHAMPHASTIDÆ.

*1. RHAMPHASTOS INCA, Gould.

Un exemplaire de Huayabamba du 7 juillet 1880. Iris d'un gris obscur.

*2. PTEROGLOSSUS HUMBOLDTI, Wagl.

Une paire d'oiseaux adultes des deux sexes, recueillis à Yurimaguas en mars 1881. Iris rouge cerise.

Une jeune femelle de la même localité, tuée le 25 février 1881, paraissant appartenir à la même espèce, a le bec beaucoup plus court que dans les adultes, à bords de la mâchoire non dentelés, noire à l'extrémité et noirâtre avec une légère nuance orangée au dos, orangée sur les côtés; mandibule brune noirâtre sur les côtés, noire au bout et orangée finement en dessous. Une singulière armure couvre tout le talon; c'est un tubercule corné couvrant toute la surface de cette partie, hérissé en dessus de 4 ou de 5 grosses épines aiguës, dont les deux inférieures dirigées en avant sont creuses sur leur face interne, et les autres rangées sur le bord externe du talon sont plus petites et dirigées en arrière. La coloration de cet oiseau ne présente aucune différence de celle des femelles adultes, si ce n'est que la couleur du plumage des jambes est plus pâle et mélangée en grande partie d'olive. Iris brun grisâtre foncé; pattes olives; peau nue au dessus de l'œil bleue verdâtre, au dessous plombée violâtre, une tache triangulaire peu distincte se trouve derrière l'œil. Longueur totale 357, vol 416, aile 119, queue 116, bec 62 millim.

***3. Pteroglossus flavirostris, Fras.**

Deux exemplaires de Yurimaguas du 3 février 1881. Iris rouge cerise, foncé.

4. Selenidera reinwardti (Wagl.); Tacz. P. Z. S. 1874, p. 578.

Un mâle recueilli à Yurimaguas le 23 janvier 1881. Iris en dessus et en dessous de la prunelle jaune, devant et derrière la prunelle d'un gris foncé, ce qui donne à cette dernière une forme oblongue en apparence, le tout entouré d'une bordure verte.

5. Andigena cucullata (Gould); Tacz. P. S. Z. 1874, p. 548.

Une paire de Chachapoyas et de Tamiapampa (9000'), tuée le 13 septembre et le 12 novembre 1879. Iris jaune verdâtre dans le mâle et vert dans la femelle.

Capitonidæ.

1. Capito auratus, Dumont; Tacz. P. Z. S. 1874, p. 549.

Un mâle de Yurimaguas.

***2. Capito steerii, Scl. P. Z. S. 1878, p. 140.**

Deux mâles et une femelle de Chirimoto et de Huambo recueillis en mai et en juillet 1880. Iris gris foncé chez le mâle.

La femelle ressemble en tout à celle du *C. glaucogularis*, Tsch., et ne s'en distingue que par la lunule gulaire rouge remplacée par une tache petite et d'une couleur moins intense. Elle est d'une taille un peu moins forte. Iris brun foncé; bec verdâtre sale, à dos gris corné; pattes olives. Longueur totale 170, vol 233, aile 69, queue 42, bec 23·5 millim.

PSITTACIDÆ.

*1. ARA MACAO (L.).

Un oiseau vivant de Yurimaguas.

*2. ARA ARARAUNA (L.).

Un oiseau vivant de Yurimaguas.

3. CONURUS LUCIANI (Deville); Tacz. P. Z. S. 1874, p. 549.

Une paire de Yurimaguas.

*4. BROTOGERYS XANTHOPTERA (Spix).

Un exemplaire vivant de Yurimaguas.

*5. BROTOGERYS JUGULARIS, Deville.

Un exemplaire de Yurimaguas.

*6. CHRYSOTIS FESTIVA (L.).

Un oiseau vivant de Yurimaguas.

7. CHRYSOTIS MERCENARIA (Tsch.); Tacz. P. Z. S. 1874, p. 550.

Un mâle de Huambo du 12 mars 1880. Iris rouge très foncé. Cet exemplaire est d'une taille plus forte que l'oiseau de Maraynioc et présente quelques légères différences dans les détails de la coloration, surtout dans la queue.

Un œuf trouvé dans un trou d'arbre est très court, à coque orangée dans sa transparence. Long. de 36·3 sur 31 millim de largeur.

*8. CHRYSOTIS AMAZONICA, Scl.

Un exemplaire vivant.

*9. CAICA MELANOCEPHALA (L.).

Un mâle de Yurimaguas tué le 15 mars 1881. Iris composé d'un anneau double, dont l'intérieur est gris très foncé, entouré de rouge cramoisi, changeant en orangé après la mort de l'oiseau.

*10. PSITTACULA PASSERINA (L.)?

Un mâle tué à Yurimaguas le 13 mars 1881, a le croupion vert comme celui de la femelle sans aucune trace de nuance bleue. Iris gris clair.

STRIGIDÆ.

SCOPS BRASILIANUS (Gm.).

Un jeune oiseau tué à Yurimaguas le 18 février 1881.

FALCONIDÆ.

1. ASTURINA MAGNIROSTRIS (Gm.); Tacz. P. Z. S. 1874, p. 552; 1879, p. 241.

Un exemplaire tué à Huambo en février 1880. Iris jaune; cire et pattes orangées.

*2. **Buteo pennsylvanicus** (Wils.).

Une femelle tuée à Huambo le 9 mars 1880. Iris brun marron clair; cire jaune sale; pattes d'un jaune orangé.

*3. **Accipiter pileatus** (Tem.).

Une femelle adulte de Huambo tuée le 26 avril 1880. Iris orangée; cire noire en dessus; bec noir avec la partie grise au dessous des narines; pattes jaunes orangées. Longueur totale 440, vol 797 millim.

*4. **Micrastur mirandollei**, Schl.

Un oiseau adulte de Yurimaguas, tué le 2 mars 1881. Iris gris foncé.

5. **Harpagus bidentatus** (Lath.); Tacz. P. Z. S. 1874, p. 550.

Un mâle tué à Huambo le 22 février 1880. Iris d'un roux cannelle rougeâtre; cire jaune verdâtre sale; pattes jaunes orangées.

*6. **Hypotriorchis rufigularis** (Daud.).

Un mâle de Huambo du 18 avril 1880. Iris brun foncé; cire jaune; pattes jaunes orangées.

CATHARTIDÆ.

* 1. **Œnops pernigra**, Sharpe.

Cathartes aura, d'Orb. Voy. Amér. mér. iv. p. 38, tab. i. f. 3.

Un mâle tué à Huambo le 12 avril 1880. Iris gris avec des rayons blancs très fins autour de la pupille. Tête nue, d'un rouge violet avec une grande tache occipitale blanche quand les plis de la peau sont rassemblés. Bec blanc d'ivoire; pattes blanchâtres à doigts noirâtres.

ARDEIDÆ.

*1. **Ardea cocoi**, L.

Une jeune femelle du Corral, tuée le 17 août 1880. Iris jaune clair.

*2. **Ardea agami**, L.

Un mâle adulte de Yurimaguas.

3. **Tigrisoma salmoni**, Scl. et Salv.; Tacz. P. Z. S. 1879, p. 242; 1880, p. 212.

Un mâle tué à Huambo en avril 1880.

ANATIDÆ.

Dafila oxyura, Meyen; Tacz. P. Z. S. 1874, p. 554.

Un exemplaire tué à Rumucucha le 3 octobre 1880.

COLUMBIDÆ.

1. COLUMBA DENISEA, Temm.; Tacz. P. Z. S. 1874, p. 555.

L'œuf, recueilli à Chirimoto en février, présente les dimensions suivantes: 39·3 × 29 millim.

*2. COLUMBA RUFINA (Temm.).

Un exemplaire tué à Chirimoto le 20 juillet 1880. Iris d'un rouge framboise extérieurement et d'un gris violâtre très foncé autour de la pupille.

*3. COLUMBA VINACEA (Temm.).

Un exemplaire de Huambo tué le 20 février 1880. Iris gris violâtre, presque de la nuance du sommet de la tête, mais un peu plus foncé; paupières grises; tour de l'œil dénudé carné violâtre.

*4. PERISTERA GEOFFROYI (Temm.).

Une femelle de Rumucucha, tuée le 27 août 1880. Iris rouge clair.

5. GEOTRYGON MONTANA (L.); Tacz. P. Z. S. 1874, p. 556; 1879, p. 243.

Un mâle de Cococho, tué le 28 août 1879, et un mâle de Yurimaguas du 9 mars 1881. Iris ocreux.

CRACIDÆ.

1. PENELOPE SCLATERI, Gr.; Tacz. P. Z. S. 1874, p. 550; 1879, p. 243.

Trois exemplaires de Tamiapampa tués en novembre 1879. Iris brun rougeâtre.

2. PENELOPE BOLIVIANA, Reichb.; Tacz. P. Z. S. 1874, p. 558.

Une femelle tuée à Yurimaguas le 7 février 1880, distincte des oiseaux du Pérou central par le fond des parties inférieures du corps fort roussâtre, et les stries fauves au lieu de blanches. Iris brun foncé: parties nues de la face grises d'acier; peau nue de la gorge rouge carnée.

3. PENELOPE RUFIVENTRIS, Tsch.

Deux mâles de Tamiapampa, tués en novembre 1879, s'accordent en tout avec la description et la figure de la 'Fauna Peruana,' tandis que les trois exemplaires fournis précédemment par M. Jelski du Pérou central diffèrent par la disposition de la couleur plombée sur le devant du cou. La peau nue chez les oiseaux vivants de Tamiapampa est d'un bleu outremer; bec noir; pattes rouges brunâtres à doigts bruns avec une nuance rougeâtre très faible; iris rouge brunâtre.

4. ORTALIDA GUTTATA (Spix).

Une femelle et un poussin recueillis à Chirimoto le 6 juillet 1880.

Cette femelle se distingue de celle du Pérou central par le manque complet des taches blanches sur le devant de l'abdomen. Bec gris bleuâtre ; cire et les paupières plombées ; pattes roses ; iris brun foncé.

RALLIDÆ.

RALLUS NIGRICANS, V.

Un mâle adulte tué à Huambo le 12 avril 1880. Iris terre-de-Sienne foncé.

SCOLOPACIDÆ.

TRINGOIDES MACULARIUS (L.) ; Tacz. P. Z. S. 1877, p. 330.

Deux femelles adultes tuées à Huambo à la fin de mars 1880.

PODICIPITIDÆ.

***PODICEPS DOMINICUS (L.).**

Sept exemplaires adultes recueillis à Rumucucha en juin et en juillet 1880. Iris jaune.

Les poussins en duvet, recueillis en juillet, ont le sommet de la tête noir avec une tache rousse au milieu et une série de raies blanches disposées comme il suit : une strie médiane devant la tache rousse, un sourcil au dessus de chaque œil ; une raie postoculaire, raie oblique cervicale prolongée sur toute la longueur du cou et un chevron nuchal passant aussi sur le cou ; joues, gorge et le devant du cou sont blancs variés de lignes noirâtres, dont une passe depuis le menton sur toute la longueur de la gorge et du cou ; deux autres de chaque côté du cou, une sur les côtés de la gorge et l'autre tout le long du bas des joues. Dos gris noirâtre parsemé de poils blancs ; poitrine et flancs gris foncés mêlés de poils blanchâtres ; milieu du dessous largement blanc. Iris presque noir.

Les œufs des deux pontes ressemblent à ceux du *P. minor* de l'Europe, et sont en général un peu plus petits. Dimensions : 36 × 25, 35·5 × 27·8, 36·3 × 27·8, 35 × 25, 37·3 × 25·7 millim.

TINAMIDÆ.

1. **CRYPTURUS OBSOLETUS (Temm.)** ; Tacz. P. Z. S. 1874, p. 563.

Six adultes et un jeune de Chirimoto, recueillis en juillet et en septembre 1880. Iris gris clair chez le mâle, gris chez la femelle.

2. **NOTHOPROCTA CURVIROSTRIS, Scl. ?**

Un jeune oiseau couvert presque en entier de plumes, tué à Chachapoyas le 23 septembre 1879, me paraît appartenir à cette espèce.

2. Descriptions of new Genera and Species of Phytophagous Coleoptera. By MARTIN JACOBY.

[Received November 31, 1881.]

LAMPROSOMA, Kirby.

1. **LAMPROSOMA GRANDE**, sp. nov.

Subglobular, very convex, black below, above brilliant metallic green. Head very finely, thorax distinctly punctured; elytra rather deeply punctate-striate, the interstices finely scratched.

Length $3\frac{1}{2}$ lines.

Hab. Amazons.

Head very broad, finely and closely punctured, the front with an obsolete depression; clypeus separated from the face by a short but deep impression at the sides only, anterior border deeply concave. Labrum fulvous. Jaws and antennæ black, the basal joint of the latter metallic green above, fulvous below. Thorax more than three times as broad as long, the sides greatly deflexed, the posterior lobe rounded and large, obliquely and distinctly impressed at each side, surface closely and more distinctly punctured than the head. Scutellum metallic green. Elytra regularly convex, scarcely narrowed behind, the lateral lobe not much produced, subangulate; each elytron with ten rows of punctures deeply impressed at the base, but much smaller towards the apex, the interstices finely scratched. Prosternum rather longer than broad, its surface with a few deep punctures.

A single specimen is contained in my collection.

The present species is allied to *L. amethystinum*, Lac., *L. cuneatum*, Baly, and *L. canaliculatum*, Baly, but differs from all of them in the more narrow transverse thorax, broader scarcely attenuated shape, the finer punctuation of its head and thorax, and the shape of its clypeus; the shape of the thorax is almost that of *Lychnophaës laticollis*, although to a less extent. On the whole the present species bears a great resemblance in shape and colour to the last-named insect; but the appendiculate claws show it to be a true *Lamprosoma*.

LYCHNOPHAËS, Lacordaire.

2. **LYCHNOPHAËS AFRICANA.**

Broadly ovate, moderately convex, black. Thorax extremely finely punctured and strigose; elytra finely and irregularly punctured, a scutellar spot and a lateral band from the base to the apex metallic cupreous.

Length 2 lines.

Hab. South Africa.

Head convex at the vertex only, subdepressed at the middle, finely longitudinally strigose; epistome limited at each side in front of the eyes by a short transverse depression. Eyes very slightly

Head flat, slightly depressed between the eyes, closely covered with fine longitudinal striæ, a triangular space between the eyes impunctate and smooth; anterior margin of the clypeus perfectly straight. Labrum transverse, black. Antennæ shorter than the thorax; fulvous, the first joint metallic æneous, dentate from the seventh joint. Thorax nearly four times as broad as long, the posterior margin moderately produced at the middle, the median lobe not produced and straight; sides rounded, the entire surface closely covered with elongate punctures and fine longitudinal striæ. Scutellum rather broad, triangular, smooth. Elytra slightly broader at the base than the thorax, regularly convex, the apex rounded, with an obsoletely raised short costa near the lateral margin towards the apex; lateral lobe moderately produced and rounded; surface covered with smaller and larger punctures on the disk, the sides and apex finely and closely strigose; entirely of a metallic bronze colour. Underside and legs of the same colour,' closely rugose-punctate; the abdominal segments of nearly equal length; tarsi fulvous. Prosternum rather broader than long, compressed and narrowed behind, rugose-punctate.

Two specimens are contained in my collection.

I may add to the above description, that the elytra in both the specimens before me are covered with small purplish spots of different shape and position, which I attribute to accident or discoloration of the ground-colour, although I cannot be sure about it. One specimen shows also a short pygidium, while the latter is totally covered by the elytra in the other.

EUMOLPIDÆ.

EULYCHIUS, nov. gen. (sect. *Typophorinæ*).

Antennæ with the last five joints widened, last three joints broadly transverse, wider than long. Eyes distant, entire. Prosternum narrowed at the middle, its base truncate; femora without teeth; intermediate tibiæ notched at the apex. Claws bifid, the inner division minute.

Type, *Eulychius madagascariensis.*

This genus may be at once distinguished from all those belonging to the *Typophorinæ* by the broadly transverse and flattened apical joints of the antennæ. It seems to be allied to the genus *Sybriacus*, Har., but differs in the unarmed femora and bifid claws.

4. EULYCHIUS MADAGASCARIENSIS, sp. nov.

Oblong, rufous; last three joints of the antennæ black; thorax coarsely punctured; elytra finely punctate-striate, black, opaque, shoulders and the apex rufous.

Length 2½ lines.

Hab. Madagascar.

Head rather closely and strongly punctured. Clypeus separated from the face by an obsolete transverse groove. Labrum testaceous. Antennæ extending to the base of the thorax; first joint subglobular, the lateral margin, one before, the other behind the middle, fulvous. Underside, knees, tibiæ, and tarsi black, femora fulvous; four posterior tibiæ armed with an acute long triangular tooth at their outside.

In my collection.

MENIUS, Chapuis.

6. MENIUS VIRIDIÆNEUS, sp. nov.

Ovate, convex, dark greenish æneous. Antennæ and the legs obscure fulvous; thorax deeply but not closely punctured; elytra very deeply and regularly punctate-striate, the interstices convex anteriorly.

Length 2 lines.

Hab. Cameroons (the plains.)

Front of head rather swollen, obsoletely and finely punctured, with a distinct but short longitudinal groove between the eyes, the latter with a distinct, posteriorly widened groove at their inner margin. Clypeus separated by a triangular impressed line from the face. Labrum fulvous. Antennæ half the length of the body, filiform, entirely fulvous, or with the apical joints piceous. Thorax about twice as broad as long, distinctly narrowed from the base to the apex, its sides but little rounded, surface impressed with deep but rather remotely placed punctures. Scutellum subtriangular, its apex acute. Elytra slightly wider at the base than the thorax, convex, regularly and deeply punctate-striate near the base, much more finely towards the apex; below the shoulder several striæ are united at their ends and their commencement and are only half the length of the rest; interstices impunctate, subcostate near the base, but flat posteriorly. Femora with a short acute tooth.

Collected by Mr. Rutherford. Collection Jacoby.

This species is allied to *M. costatus*, Baly, but is larger, differently shaped, the thorax much more strongly punctured, and the elytra are devoid of the strongly raised costæ near the lateral margin.

TERILLUS, Chapuis.

7. TERILLUS POROSUS, sp. nov.

Elongate, convex, fulvous, finely pubescent below. Thorax irregularly and moderately strongly, elytra foveolate punctate, the interior of the punctures metallic green.

Length 3½–4 lines.

Hab. Australia, Cooktown.

Head very minutely and closely punctured, and covered with fine silvery pubescence. Antennæ half as long as the body, third joint double the length of the second, light fulvous. Thorax about twice as broad as long, its sides straight, disk longitudinally obsoletely sulcate from the base to the apex, rest of the surface irregularly covered with rather fine punctures, pubescent like the head. Scutellum smooth. Elytra foveolate-punctate, the punctures near the base arranged in irregular double rows, the rest confusedly distributed, interstices transversely wrinkled and costate near the apex; the interior of the punctures, especially near the lateral and sutural margins, metallic green. Underside and legs fulvous, closely covered with fine silvery pubescence.

In my collection.

Cheiridea, Baly.

8. Cheiridea subrugosa, sp. nov.

Oblong, convex, metallic green, pubescent. Legs cupreous. Thorax deeply punctate, its sides serrate. Elytra punctate-striate and transversely rugose, subpubescent, metallic green, with a broad transverse black band at the middle.

Length 4 lines.

Hab. Cameroons.

Head rugose punctate, thinly covered with long white hairs. Labrum and jaws, as well as the palpi, black. Antennæ nearly half the length of the body, the joints robust and (with the exception of the first three joints) elongate, black. Thorax subquadrate, its sides slightly rounded and serrate, all the angles acute; surface deeply and rather closely punctured, the interstices laterally transversely wrinkled; metallic green, covered with thin white hairs at the sides. Scutellum pentagonal, thickly covered with white pubescence. Elytra wider than the thorax, convex at the middle and acutely pointed at the apex, irregularly transversely rugose and deeply punctured, the interstices subcostate at the disk, metallic green, this colour divided at the middle of each elytron by a broad transverse black band which does not quite reach the suture, this band is limited anteriorly and posteriorly by thick white pubescence, which is also prominent towards the apex in the shape of longitudinal striæ, principally near the sutural margin. Underside obscure metallic green, closely pubescent. Legs cupreous, femora without tooth. Claws appendiculate.

In my collection.

This handsome species bears a close resemblance to ***Pseudocolaspis timialithus***, Thoms., in regard to shape and colour, and might be easily mistaken for that species if the generic characters were not totally different. The serrate sides of the thorax, filiform antennæ, and the appendiculate claw show it, however, to belong to Baly's genus *Cheiridia*, described in the Journ.Linn. Soc., Zool. vol. xiv. p. 253.

HALTICIDÆ.

Diamphidia, Gerstäcker.

9. Diamphidia angolensis, sp. nov.

Broadly ovate, convex, testaceous or flavous. Antennæ simple, black; sides of the breast, knees, tibiæ and tarsi, three spots on the head, and five on the thorax black; elytra very closely punctured, black, sutural and lateral margins and a pear-shaped spot from the base to the middle flavous.

Length 4½–5 lines.

Hab. Angola (Africa).

Head with a few fine punctures, flavous, a rhomboidal spot at the middle and one on each side at the base black. Antennæ black, the second and third joints and the apex of the terminal one fulvous. Thorax nearly three times as broad as long, the sides very moderately rounded, anterior angles acute; surface finely and not very closely punctured on the disk, much more closely towards the sides; a broad subquadrate irregular-shaped black spot is situated at each side, and connected anteriorly with a small round spot, another oblong one being placed in the middle of the base. Scutellum black. Elytra extremely closely subrugulose punctate, black, the margins narrowly testaceous, but interrupted at the apex by an elongation of the black portion; an elongate pear-shaped testaceous spot extends from the middle of the base in an oblique direction to the middle of the elytra. Underside closely pubescent.

Four specimens of this well marked species are contained in my collection. The design of the elytra and thorax will distinguish this insect from any of its allies.

GALERUCIDÆ.

LUPERODES, Motsch.

10. LUPERODES MARGINATUS, sp. nov.

Oblong, convex, light flavous below. Antennæ, their basal joints excepted, piceous. Above pale olive-green, extreme lateral margins of the elytra and their epipleuræ black.

Length 3 lines.

Hab. Africa, Lagos.

Head not longer than broad, with a well marked transverse groove between the eyes, finely punctate, the latter black, prominent. Antennæ two thirds the length of the body, obscure piceous, the two or three basal joints flavous, joints 2 and 3 very short, of nearly equal length, the rest filiform and slender. Thorax narrowly transverse, its sides straight and narrowed from base to apex, the angles obtuse and rather rounded; surface like the head, very minutely punctured. Scutellum triangular. Elytra convex, parallel, more distinctly punctured than the thorax, of a very pale greenish tint, with the lateral and apical margins black; this colour is narrowed gradually towards the base, where it is very narrow. Underside and legs flavous, finely pubescent; last abdominal segment in some specimens black.

Collection Jacoby.

The genus *Luperodes*, resembling in its general appearance the genus *Monolepta*, may be known by the very long first tarsal joint of the posterior legs, the tibiæ of which are armed with a long spine, in connexion with the open anterior coxal cavities.

11. LUPERODES AUSTRALIS, sp. nov.

Oblong, convex, flavous; apical joints of the antennæ, and the breast, black; elytra minutely punctured, flavous, the base and a small spot below the middle rufous.

3. On the African Mungooses.

By Oldfield Thomas, F.Z.S., British Museum.

[Received December 2, 1881.]

(Plate III.)

In the Zoology of the Yunnan Expedition[1], Dr. John Anderson of the Calcutta Museum has recently fully worked out the Oriental species of that difficult Viverrine group, the Mungooses; and the present paper is an attempt to treat similarly those that are found in Africa. The latter, however, are very much less uniform in structure than the former, as they belong to no less than seven genera, six being peculiar to Africa, while the Oriental forms, as Dr. Anderson has shown, ought all to be included in the restricted genus *Herpestes*.

The Oriental and African Mungooses together form a very natural subfamily, the Herpestinæ[2], quite distinct from the other large group of the Viverridæ, namely the Civets and Paradoxures, or *Viverrinæ*. Prof. Flower, in his well-known paper on the classification of the Carnivora[3], says of the Viverridæ (p. 35) that "they show a great tendency to break into two groups, of which *Viverra*, *Paradoxurus*, *Arctictis*, &c. belong to one, and *Herpestes* and its various modifications to the other, *Rhyzæna* being an aberrant member of the last," and (p. 20) gives a description of the characters of the base of the skull in this group, compared with those of the Viverrinæ. Externally the members of this subfamily are distinguished by their comparatively lithe and slender form, and by their generally blunt, elongated, and but slightly curved claws, as compared with the short, sharp, semiretractile, and strongly curved claws of most of the Viverrinæ.

The following are the only two previous papers of any importance on the subject of the African species of this group:—(1) Temminck, Esq. Zool. Côte Guinée, pp. 93–118 (1853); and (2) Gray, P.Z.S. 1864, pp. 547–579.

The first of these contains much useful information, especially with regard to the variation to which these animals are subject; nevertheless, notwithstanding his clear insight into the badness of other people's species, Temminck formed several bad species of his own in it. The second, by Dr. Gray, is a complete revision of the group, in which, however, such a large number of untenable genera are formed, and so many bad species are made and allowed, that the confusion into which the group had fallen cannot be said to have been removed by it. On the other hand, it must be admitted that his general arrangement of the group seems to be a very natural one, and has, in its main outlines, been followed here.

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[1] *Op. cit.* p. 168 (1878).

[2] On the principle of strict priority this name ought to be *Suricatinæ*, *Suricata* antedating *Herpestes* by seven years; but it would be so obviously unsuitable to call the subfamily after one of its most aberrant members, that I think we are justified in using the later and more classical term.

[3] P.Z.S. 1869, p. 4.

With regard to the genera treated of, I have only taken those found actually on the continent of Africa, and have therefore not included the aberrant forms *Galidia*, *Galidictis*, and *Eupleres*[1], which are only found in Madagascar, and of which the species present but little difficulty, so that there is no need for any special revision of them[2]. On the other hand, none of the true Mungooses are indigenous to Madagascar, though one or two of them have been recorded from there; but these would seem either to have been introduced, or the correctness of their locality to have been very doubtful. It must be remembered that the artificial introduction of animals of this group is by no means unlikely, as Mungooses are constantly tamed by the natives, and would thus easily be carried by them from one place to another[3].

In preparing this paper I have had the advantage of examining the collections, each possessing many typical specimens, contained in the Berlin, Leyden, and Frankfort Museums, in addition to the large series in our own national collection. I have thus seen nearly 250 African Mungooses, including the types of the species described by Gray, Peters, Rüppell, Temminck, Smith, and others, the names of these species being marked with asterisks in the synonymy below. All together, of the *seventy-five* good and bad species described, I have examined the types of thirty-one, the greater part of the remainder being species named either from rough travellers' descriptions, from previously published figures, or else merely in alteration of earlier names.

I must here thank Prof. Peters of Berlin, and Prof. Schlegel and Dr. Jentink of Leyden for the facilities they have afforded me of seeing the specimens under their charge, and Prof. Milne-Edwards for much useful information with respect to the typical specimens contained in the Paris Museum.

Before commencing the detailed review of the species, I think it will be useful to make a few remarks concerning the characters which should be especially attended to by any one wishing to name an African specimen of this group.

In the first place, I would call attention to the variation to be observed in the coloration of certain species: thus in *Herpestes gracilis*, the three varieties are extraordinarily different in their general colour, while the plan of coloration and all other characters are precisely identical; these different colours moreover are not strictly confined to any locality, though there is a certain tendency for all, or at least most of the specimens from one district to be alike in colour; in fact, if this had not been so, I should not have felt justified in regarding the various forms even as distinct varieties. Again, *H. albicauda* varies most peculiarly in the amount of white present on the tail, some specimens having that member nearly entirely white and others wholly black, individuals of each type being moreover found in the heart of the district mostly inhabited by those of the other. Another remarkable point in connection with variation in colour is the fact that in certain species there seem to be two forms, one with annulated and the other with unannulated fur. Thus ordinary specimens of *H. galera*, Gr., have annulated fur, while others from various localities, among which are the types of *H. pluto*, Temm., have their longer hairs entirely unannulated. In the same way *H. mutgigella*, Rüpp., seems to be the unannulated form of *H. gracilis*, *H. iodoprymnus*, Heugl., being intermediate, and *H. granti*, Gr., similarly that of *H. badius*. It is of course possible that these two forms represent a seasonal change, though the few dated specimens that I have seen do not, on the whole, lend much support to this view, especially when we remember how comparatively little seasonal change of temperature must occur in the region with which we now have to deal.

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[1] These genera all differ from the continental Mungooses in not possessing an alisphenoid canal, a character present in all those treated of here.

[2] Dr. Jentink has recently worked out the species of the genus *Galidia* (Notes Leyd. Mus. i. p. 131, 1879).

[3] The only true Mungoose collected without doubt in Madagascar, that I know of, is a young individual of *Crossarchus fasciatus*, obtained by Van Dam, and now in the Leyden Museum. Prof. Milne-Edwards informs me that, in his opinion, "Le Vansire" (*Herpestes galera*), usually said to have originally come from Madagascar,. was certainly not obtained there, no other collectors having met with it in that island since.

In the second place, attention should be drawn to the apparent frequency with which specimens of this group seem to lose the minute first toes on both fore and hind feet. Thus both "*Cynictis*" *melanura* and "*Galerella*" *ochracea* [1] owe their generic names to the fact of their halluces having been accidentally lost; and *Bdeogale nigripes*, Puch., has probably been referred to that genus for the same reason [2]. In the work already referred to[3], Temminck has drawn attention to this same point, and has given several instances which had fallen under his own observation. The minute claw of the first toe is probably very easily knocked off during the skinning and stuffing of specimens; and the digit itself, without the claw, is so small and inconspicuous that it would not be observable without the closest scrutiny. On the whole it would seem that though some few cases may occur in which the claw has either never been developed or has been knocked off during life, yet as a rule, so far as I have seen, the loss has probably occurred after death, there being generally distinct traces of the former presence of the claw, thus showing that it could not have been lost during life, for then the skin would presumably have healed over the place.

Thirdly, it is worthy of note that while the *dimensions* of the teeth are very constant, their number is by no means so: thus, one of our specimens of *Crossarchus zebra* (p. 89) has an additional true molar above on each side behind the two normal ones, the extra ones not being in any way crowded or rudimentary, but fully developed, and looking quite as if that species always possessed them. Again, a specimen of *H. gracilis* has an additional lower premolar standing side by side with the third normal one; but this differs from the last instance in being more obviously an abnormality. The type of *Rhinogale melleri*, as mentioned below (p. 81), has one more upper premolar on each side than is found in any other species of the group; but as, so far as I know, this typical specimen is unique, I cannot say whether the dental formula possessed by it is constant or not. On the other hand, a deficiency in the full number of teeth is very common, all the species with normally four upper premolars often losing the first one, which when present is always much smaller than any of the others.

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[1] I have softened and opened the skin of the hind foot of the type of this species, and found, as I expected, a broken metatarsus, about one tenth of an inch in length, and of the usual thickness, adhering to the entocuneiform bone.

[2] See below, p. 77.

[3] *Op. cit.* p. 107.

It has just been mentioned that the dimensions of the teeth are very constant; and so much is this the case that I have found that the comparative measurements of the fourth upper premolar and second molar afford very good specific characters; for in those species in which the teeth are more or less round and suitable for grinding rather than cutting, the second molar is of considerable size and the fourth premolar is but little larger, while, on the other hand, when the teeth are slender, angular, and with cutting-edges, as in *H. ichneumon*, the last molar is very small and rudimentary and the last premolar is large and has a well-developed anterior internal process. As an instance of these differences, I may mention the cases of *H. albicauda* and *H. ichneumon*, in the first of which the last molar is from 71 to 84 per cent. of the fourth premolar, while in the latter these percentages range only from 42 to 45.

The measurements upon which these percentages are founded are those of the greatest diameter of the tooth—in the fourth premolar from the posterior point of the tooth to the anterior edge of the internal lobe, and in the last molar simply the greatest transverse diameter of the tooth. The percentages obtained by these measurements are called in the synopses of the species the "dental percentages;" and a table is given at the end of each genus showing the exact dimensions, with the resulting percentages, of the teeth of its members.

Synopsis of the Genera.

A. With a naked groove from the muzzle to the upper lip.
  I. Toes 5—5.
    a. Premolars $\frac{4}{4}$ (if only 3 in either jaw, a diastema always present) .... I. HERPESTES.
    b. Premolars $\frac{3}{3}$ (no diastema in front of 1st premolar). Hind soles naked .... II. HELOGALE.

  II. Toes 4—4.
    c. Premolars $\frac{4}{4}$. Hind soles hairy .... III. BDEOGALE.

  III. Toes 5—4.
    d. Premolars $\frac{4}{4}$. Hind soles hairy .... IV. CYNICTIS.

uniform. Dr. Anderson, in the work quoted above, has fully described and figured the skulls and dentition of the Indian forms; and the African ones are very similar, if we except *H.* (*Ichneumia*) *albicauda*, which has, of course, as forming a distinct subgenus, many characters peculiar to itself.

Synopsis of the Species.

A. Tarsus nearly or quite naked below. Upper M^2 40–60 per cent. of $P.M^4$. Last lower molar small, with only 2 external cusps. (Subgenus HERPESTES.)	
I. Tip of tail with a dark-coloured pencil.	
a. Tail-tip black.	
α. Size large: head and body 20 in. or more.	
a′. Skull half as broad as long. Palæarctic	1. *H. ichneumon*, p. 64.
b′. Skull less than half as broad as long. Ethiopian	2. *H. caffer*, p. 66.
β. Size small: head and body 12–14 in. ...	3 *H. gracilis*, p. 68.
b. Tail-tip red.	
γ. Size small: head and body about 12 in. ...	4. *H. sanguineus*, p. 71.
II. Tip of tail not darker.	
c. Dark rufous. Size large: head and body 20–26 in.	5. *H. galera*, p. 72.
d. Dark grizzled grey. Size medium: head and body 14–15 in.	6. *H. pulverulentus*, p. 74.
e. Light grizzled grey. Size small: head and body 10–13 in.	7. *H. punctatissimus*, p. 74.
B. Tarsus hairy beneath. Upper M^2 more than 70 per cent. of $P.M^4$. Last lower molar large, with 3 external cusps. (Subgenus ICHNEUMIA).	
I. Tail very bushy. Size large, 22–26 in.	8. *H. albicauda*, p. 75.

1. HERPESTES ICHNEUMON.

Viverra ichneumon, Linn. Syst. Nat. i. p. 63 (1766).

Ichneumon pharaon, Lacép. Mém. de l'Inst. iii. p. 492 (1801).

Ichneumon ægypti, Tiedem. Zool. i. p. 364 (1808).

Herpestes pharaonis, Geoff. Descr. de l'Egypte, H. N. ii. p. 139 (1812).

H. numidicus, F. Cuv. Hist. Nat. Mamm. iv. livr. 68 (1834).

* *H. widdringtoni*, Gray, Ann. & Mag. N. H. ix. p. 50 (1842).

H. dorsalis, Gray, P. Z. S. 1864, p. 549 (ex Smith, S. Afr. Quart. Journ. ii. p. 113, 1835) (1864).

Hab. Southern Spain, Asia Minor, Palestine, and Africa north of the Sahara.

Size large, about 20 inches; form slender; tail about 4 to 5 inches shorter than the head and body. Fur long, especially on the rump and basal quarter of the tail, where the longer hairs are often 4 or more inches in length. General colour dark grizzled grey-brown, the hairs annulated with dark red-brown and creamy yellow, the tips of the back hairs darker yellow. Underfur thick and woolly, bright rufous in colour. Tip of tail shining black, the hairs elongated so as to form a distinct tassel, sometimes reaching 5 inches beyond the vertebræ. Feet dark brown. Underside of hind feet generally quite naked, the part under the calcaneum sometimes, though rarely, hairy.

2. **HERPESTES CAFFER.**

Viverra cafra, Gmel. Linn. S. N. i. p. 85 (1789).
H. griseus, Smuts, Enum. Mamm. Cap. p. 19 (nec Desm.) (1832).
H. madagascariensis, Smith, S.Afr. Quart. Journ. ii. p. 114 (1835).
? *Herpestes bennettii*, Gray, Loudon's Mag. N. H. i. p. 578 (1837).

Hab. Africa south of the Sahara.

Somewhat larger than *H. ichneumon*, about 23 inches. Colours as in that species, with the following exceptions:—The annulations on the longer hairs are somewhat narrower, and consist of deep shining black and pure white rings, instead of brown or yellow ones, thus causing the general colour to be a much clearer grey; and the underfur is dark and dull (not bright) rufous, and sometimes simply dark grey-brown. Underside of hind feet always naked. Skull, compared with that of *H. ichneumon*, longer and narrower, the breadth always less than half the length (46 to 48 per cent.). Teeth and other characters as in *H. ichneumon*.

Dimensions.

	Head and body.	Tail.	Hind foot.
a. Kingwilliamstown (*Trevelyan*) ..	22·0	18·0	3·7
b. S. Africa	23·0	19·0	3·9
c. „	23·0	19·0	4·0
d. „	23·0	19·0	4·0

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of the muzzle, a dimension not satisfactorily shown by merely taking the "palate-length," because the amount to which the bony palate extends behind the molars varies considerably, both between different individuals and different species.

With regard to the "basicranial axis," I have been compelled, with some hesitation, to use a different measurement from that given by Prof. Huxley, because, first, his anterior point, easy enough to take in a bisected skull, cannot be found with any exactitude in a whole one; and, secondly, in many genera of Carnivora, for instance in the group at present under discussion, this spot as defined by him for a non-bisected skull ("a point opposite the middle of the distance between the optic and ethmoidal foramina") falls considerably inside the posterior nares, and does not by any means "lie a little behind the posterior extremity of the vomer," as it does in the Dogs. The axis I propose, however, is easily measured in all states of the skull; and a similar and corresponding axis may be readily obtained, not only in all the different genera of Carnivora, but also throughout almost the whole of the Mammalian class. I have, for example, long used this same axis in my notes on Rodents' skulls, where it is always very readily obtainable.

This axis, moreover, equally shows, in a horizontal line, what Prof. Huxley's axis shows in an oblique one, namely the combined lengths of the basioccipital, basisphenoid, and præsphenoid bones, which, according to that author, "represent the foundation around and upon which the other parts are built."

The measurements throughout are in English inches and tenths, except in the case of the tables of dimensions of teeth, where, a very small unit being required, they are given in millimetres.

Skulls.

	Length.	Breadth.	Palate-length.	Palate-breadth.	Incisors to cross line.	Basicranial axis.
a. Cape	c. 4·3	2·14	2·47	1·35	1·50	1·55
b. No locality ..	4·18	1·98	2·35	1·24	1·49	1·50
c. Kingwilliamstown	4·15	1·91	2·36	1·28	1·50	—

For teeth, see p. 78.

These two closely allied species, *H. ichneumon* and *H. caffer*, seem to be very common over their respective ranges. There can never be any difficulty in distinguishing either of them from all others, as their large size and long black tail-tips readily separate them from all their congeners. Their nearest ally seems to be *H. jerdoni*, Gr., from India; but that is considerably smaller, and has an entirely distinct range from either of them.

With regard to their distinctness from each other, I was at first disposed to regard them as only races of one species, as Temminck had done; but I have found such constancy in their distinguishing characters that, combined with the fact of their ranges being in different zoological *regions*, I have been induced to retain them as distinct species. There is no doubt, however, that they are very closely allied; but when we remember how very distinct the faunas of the southern Palæarctic and of the Ethiopian regions are, scarcely any species being common, it would naturally seem preferable to consider as distinct two forms so fairly well marked as are *H. ichneumon* and *H. caffer*, when the line of demarcation between them so exactly corresponds with what is generally recognized as the boundary between the two zoological regions.

I cannot find any characters whatever by which to separate, even as a variety, the Spanish Ichneumon (*H. widdringtoni*) from the form found on the southern side of the Straits of Gibraltar.

In the specific diagnosis of *H. ichneumon* given above, mention is made of the fact that occasionally the posterior part of the hind soles are hairy, instead of being bald as is usual. In connection with this, it is worthy of remark that a partly hairy sole seems to be accompanied by an increased length of the hallux, as though certain individuals or families were accustomed, probably on account of the nature of the soil, to walk in a more digitigrade manner than usual, and the hallux were in these cases elongated sufficiently to reach the ground. In *H. galera* I have also found the same thing, there being one of our West-African specimens of that species with a hairy sole and elongated hallux, whilst all others of the large series that I have examined have naked soles and short halluces.

The following will show the extent of these differences, which, being quite unaccompanied by other special characters, are most certainly not specific:—

In a hairy-soled *H. ichneumon* the posterior 0·9 in., and in the similar *H. galera* 1·45 in., is densely clothed with hair, while in all other specimens of both species there is no hair at all on the soles from toes to heel. And as to the length of the hallux, in the hairy-soled forms of the two species its claw reaches to within 0·23 and 0·27 in. from the most anterior point of the large central foot-pad, while in other specimens these measurements average 0·52 and 0·64 in. respectively.

With regard to the habits of these large Mungooses, the manner in which *H. ichneumon* destroys the eggs of the crocodile is well known; and there is no doubt that it is of considerable use to the country in this way. Smuts[1] says of *H. caffer*:—This animal lives in many parts of the Cape colony, mostly in holes in the earth. It feeds principally upon mice, the smaller birds, and amphibians, and is often kept in a state of domestication on account of the services it renders in destroying these animals."

3. HERPESTES GRACILIS.

a. Typical variety.

**H. gracilis*, Rüpp. N. Wirb. Abyss. p. 29, pl. viii. fig. 2 (1835).

**H. mutgigella*, Rüpp. t. cit. p. 29, pl. ix. fig. 1 (1835).

Ichneumia nigricaudatus, Geoff. Mag. Zool. 1839, p. 18 (1839).

H. galinieri, Guérin, Ferret & Galinier, Voy. Abyss., Atl. Zool. pl. i. fig. 1 (juv.) (1847–48).

**H. punctulatus*, Gray, P. Z. S. 1849, p. 11 (1849).

H. lefebvrei, Des Murs & Prév., Lefebvre Voy. Abyss., Atl. Zool. pl. i. (in text *H. gracilis*) (1850).

**H. ornatus*, Peters, Reise nach Mossambique, Mamm. p. 117, pl. xxvi. (1852).

H. ochromelas, Puch. Rev. et Mag. Zool. vii. p. 393 (1855).

**H. iodoprymnus*, Heugl. Nov. Act. Ac. Leop. xxix. p. 23 (1861).

H. adailensis, Heugl. Peterm. Geogr. Mittheil. 1861, p. 17 (1861).

H. mutschelitschela, Heugl. Reise N.O. Afr. ii. p. 41 (ex Rüpp.) (1877).

H. rubicauda, Heugl. Reise N.O. Afr. ii. p. 43 (1877).

Hab. East-African subregion—from Cape Verd round by Abyssinia to Natal.

β. Variety *melanurus*.

**Cynictis melanurus*, Martin, P. Z. S. 1836, p. 56 (1836).

Hab. West-African subregion—Sierra Leone to Cameroons.

γ. Variety *badius*[2].

**Ichneumon ratlamuchi et cauui*, A. Smith, App. Rep. S. Afr. Exp. p. 42 (1836).

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[1] Enum. Mamm. Cap. p. [illegible], 1832.

[2] I have used this name in preference to either of Dr. Smith's previous names for this variety, because it is [illegible] more euphonious and extremely appropriate. But Dr. Smith himself proposed the alteration, and therefore there can be no injustice in ignoring his earlier names.

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*_H. punctulatus_, Gray, P. Z. S. 1849, p. 11 (1849).

H. lefebvrei, Des Murs & Prév., Lefebvre Voy. Abyss., Atl. Zool. pl. i. (in text _H. gracilis_) (1850).

*_H. ornatus_, Peters, Reise nach Mossambique, Mamm. p. 117, pl. xxvi. (1852).

H. ochromelas, Puch. Rev. et Mag. Zool. vii. p. 393 (1855).

*_H. iodoprymnus_, Heugl. Nov. Act. Ac. Leop. xxix. p. 23 (1861).

H. adailensis, Heugl. Peterm. Geogr. Mittheil. 1861, p. 17 (1861).

H. mutscheltschela, Heugl. Reise N.O. Afr. ii. p. 41 (ex Rüpp.) (1877).

H. ruficauda, Heugl. Reise N.O. Afr. ii. p. 43 (1877).

Hab. East-African subregion—from Cape Verd round by Abyssinia to Natal.

_b._ Variety _melanurus_.

*_Cynictis melanura_, Martin, P. Z. S. 1836, p. 56 (1836).

Hab. West-African subregion—Sierra Leone to Cameroons.

_c._ Variety _badius_[2].

*_Ichneumon ratlamuchi_ et _cawi_, A. Smith, App. Rep. S. Afr. Exp. p. 42 (1836).

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[1] Enum. Mamm. Cap. p. 20, 1832.

[2] I have used this name in preference to either of Dr. Smith's previous names for this variety, because not only is it more classical and extremely appropriate, but Dr. Smith himself proposed the alteration, and therefore there can be no injustice in ignoring his earlier names.

Skulls.

	Length.	Breadth.	Palate-length.	Palate-breadth.	Inc. to cross line.	B cra a
Var. *gracilis.*						
a. Abyssinia (*Blanford*)	2·54	1·34	1·32	0·81	0·89	1
b. Natal (type of *H. punctulatus*)	2·55	1·30	1·31	0·81	0·90	—
Var. *melanurus.*						
c. Sierra Leone (*Lord Derby*)	2·5	1·32	1·40	0·80	0·90	—
Var. *badius.*						
d. Mgunda Mkali (type of *H. granti*)	2·45	1·22	1·25	0·82	0·85	—
e. S. Africa	2·5	1·27	1·29	0·80	0·85	0
Var. *ochraceus.*						
f. Abyssinia (*Hora*), imm.	c. 2·19	1·20	1·10	?	0·78	—

This variable species appears to be the common small Mungoose of the whole of Africa. The distribution of its three principal varieties is somewhat interesting as so closely corresponding to the zoological subregions of Africa, as defined by Mr. Wallace in his 'Geographical Distribution of Animals'[1]. Thus, the true *H. gracilis* is found from Cape Verd and Senegal across to Abyssinia and southwards to Natal, a range nearly exactly agreeing with the "East-African" subregion. I have seen no specimens of this species from Angola or Damaraland, so that I cannot say what, if any, form is found there; but, according to Mr. Wallace, we should also expect to find the true *H. gracilis* in that district. Again, the varieties *melanurus* and *badius* occur, the first all over the "West-," and the latter over the "South-African" subregions. It is true that specimens belonging to the true *H. gracilis* are sometimes, though rarely, found in both the other subregions, and *H. badius* occurs as far north as Zanzibar in the East-African subregion; but these facts only show the necessity for regarding the various forms as varieties, and not as species, which they might fairly be considered to be if each was strictly confined to its own district.

It will be seen by the above synonymy that the variability in colour of *H. gracilis* has caused the formation of a considerable number of untenable species. The asterisks prefixed to the names show that I have seen typical specimens of the greater part of these so-called species; and I do not think there can be much doubt in the case of any of them. In my opinion, *H. mutgigella*, which at first sight seems so different from the rest, represents simply the unannulated form of *H. gracilis*, an intermediate state being represented by a typical specimen of *H. iodoprymnus*, Heugl., in the Leyden Museum. Of the other names, I am not quite certain whether *H. adailensis*, Heugl., should not rather be placed under var. *ochraceus*; but without seeing a specimen I cannot be certain on this point.

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[1] Vol. i. p. 258, and map, p. 250 (1876).

In Temminck's paper mentioned above, very nearly the same conclusions are come to with regard to these small *Herpestæ* with black tail-tips. I am, however, disposed to demur to his statement that all the differences between what are here considered *varieties* are merely owing to seasonal change; for it would be obviously improbable that all the Abyssinian specimens known should have been taken in the winter, and nine tenths of the West- and South-African specimens in the summer. No doubt, however, a certain amount of change does take place according to season; but we cannot determine the amount of this until there are considerable series of *dated* specimens available for examination.

4. HERPESTES SANGUINEUS.

**H. sanguineus*, Rüpp. N. Wirb. Abyss. p. 27, pl. viii. fig. 1 (1835).

Hab. S. Egypt (Kordofan).

(Types, Frankfort Museum.) Form and size much as in *H. gracilis*. Fur short and rather harsh. General colour very pale fawn. Hairs annulated with brown and yellowish white, the latter predominating, and so arranged that there is an appearance of cross stripes on the posterior half of the back. Tail with longer hairs, which are annulated with black and white, though the black is not at all conspicuous. Tail-tip yellowish red, sharply separated from the rest. Feet nearly white.

Dimensions.

	Head and body.	Tail.	Hind foot.
a. Kordofan (*Rüppell*)	12·2	11·9	2·1
b. " "	12·0	12·2	—
c. " "	11·9	10·8	1·9

Skull.

	Length.	Breadth.	Palate-length.	Palate-breadth.	Inc. to cross line.
a. ..	2·35	1·15	1·18	0·73	0·82

This species, hitherto only found in Kordofan, is evidently a desert form, having the sandy coloration usually found in animals inhabiting sandy plains. Dr. Rüppell seems to have found it numerous, as he brought home five or six specimens. He states that it lives in holes in the ground, among bushes, and that, though fierce when wild, it is yet easily tamable. Herr von Heuglin also found it, though not commonly, in the same region.

Dr. Rüppell states that there are in *H. sanguineus* only 22 caudal vertebræ, while there are 25 in *H. gracilis* and 28 in *H. ichneumon*. Not having any material on which to found similar observations, I cannot say whether these numbers are constant or not; but a considerable series of perfect skeletons would be necessary before one could place any reliance upon them as a specific character.

5. HERPESTES GALERA.

a. Typical variety.

Mustela galera, Erxl. Syst. Reg. Anim. i. p. 453 (1777).
Viverra nems, Kerr, Linn. S. N. p. 160 (1792).
Mustela afra, Kerr, t. cit. p. 175 (1792).
Ichneumon galera et *major*, Geoff. Descr. Egypte, Hist. Nat. ii. p. 138 (1812).
Atilax vansire, F. Cuv. Hist. Nat. Mamm. iii. livr. 54 (1826).
Herpestes paludinosus, G. Cuv. Règne Anim. ed. 2, i. p. 158 (1829).
**Mangusta urinatrix*, A. Smith, Zool. Journ. iv. p. 437 (1829).
**Herpestes pluto*, Temm. Esq. Zool. Guin. p. 95 (1853).
**Herpestes loempo*, Gray, P. Z. S. 1864, p. 551 (nec Temm.) (1864).
Athylax vansire et *paludosus*, Gray, P. Z. S. 1864, p. 557 (1864).

Hab. West and South Africa.

b. Variety *robustus.*

**Athylax robustus*, Gray, P. Z. S. 1864, p. 558 (1864).

Hab. East Africa (White Nile).

Specific Characters.—Size very large, form stout and heavy. Tail shorter than the body without the head. General colour either grizzled reddish brown and white, or dark blackish brown without annulations[1]. Underfur greyish brown. Feet dark brown. Tail coloured like the body, but rather darker, sometimes gradually becoming nearly black towards the end, the black never sharply separated as in *H. ichneumon*. Belly similar to back. Cheeks generally with a peculiar indistinct whitish mark from the angle of the mouth to below the ear. Hind soles as a rule quite naked, sometimes with the posterior third hairy[2].

Skull very stout and heavy, the lower jaw particularly so, with a distinct and well-marked chin in adults. Teeth rather small in proportion. Last molar more than half the last premolar (56–61 per cent.).

Varietal Characters.

Var. *galera*. Smaller: skull less than 4·3 inches in length.
Var. *robustus*. Larger: skull more than 4·5 inches in length.

Dimensions.

Typical variety.	Head and body.	Tail.	Hind foot.
a. Cape	24·5	13·0	3·9
b. „	24·0	13·5	3·9
c. W. Africa	24·0	....	3·8
Var. *robustus.*			
d. Type: E. Africa	26·5	12·5	4·0

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[1] See above, p. 61.

[2] See above, p. 67.

and on the banks of the smaller rivers of the extreme south of Africa; its principal food consists of frogs, crustaceans, &c."

6. HERPESTES PULVERULENTUS.

H. pulverulentus, Wagn. Münch. Gel. Anzeig. ix. p. 426 (1839).
**H. apiculatus*, Gray, P. Z. S. 1864, p. 551 (1864).

Hab. Eastern half of the Cape colony.

Size rather small, form somewhat stout. Tail about as long as the body without the head. Soles of hind feet hairy below calcanea; the rest naked, at least in the centre. Fur rather long, soft, and shining. General colour uniform grizzled grey, the longer hairs annulated with equal-sized rings of black and white or yellow. Underfur brown for its proximal, and grey for its distal half. Tail-hairs long, coloured like the body to the extreme tip. Feet slightly darker than the body.

Skull very like that of *H. gracilis*, though somewhat stouter and the teeth heavier. Last molar less than half the length of the last premolar (43–44 per cent.).

Dimensions.

			Head and body.	Tail.	Hind foot.
a.	S. Africa	Co-types of *H. apiculatus*, Gr.	14·0	11·5	2·4
b.	"		14·0	11·3	2·6
c.	"	....	15·0	11·4	2·3
d.	"	....	13·0	10·0	2·4

Skulls.

		Length.	Breadth.	Palate-length.	Palate-breadth.	Inc. to cross line.	Basi-cranial axis.
a.	Kingwilliamstown (*Trevelyan*) ..	c. 2·7	1·39	1·38	·89	·95	—
b.	S. Africa	c. 2·65	1·33	1·35	·88	·95	—

This Mungoose reminds one somewhat of a small *H. caffer*, the colour and character of its fur being very similar, though it has not, of course, the long black tail-tip of that species. Its range seems to be rather limited, as all the specimens with exact localities that I have seen are from the eastern half of the Cape colony (Algoa Bay, Kingwilliamstown, Caffirland, Natal, &c.). It is naturally very likely that it will yet be found further north than Natal; but it is not probable that it will occur in any number, if at all, in the western districts of the colony, or it would surely have been recorded from there before this.

I have not been able to find any mention of the habits of this species.

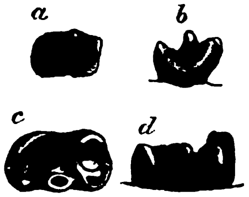
7. HERPESTES PUNCTATISSIMUS.

**H. punctatissimus*, Temm. Esq. Zool. Guin. p. 108 (1853).

Hab. West and South Africa (Gaboon, Algoa Bay, *Temm.*).

I have only seen a single specimen of this species, one of the types the body without the head. Underside of tarsus thickly hairy down to the root of the hallux. Fur of medium length. General colour blackish grey, the longer hairs ringed with black and white, the terminal third nearly always black. Underfur woolly, uniform dirty grey. Feet black. Tail-hairs very long, in some cases with white bases and long shining black tips, so that the whole tail appears to be black; in others with a long white tip beyond the black, so that then the tail appears to be white; in the latter case the hairs at the extreme tip of the tail are generally wholly white.

Fig. 1.



a, b. Last lower molars of *Herpestes ichneumon.*
c, d. „ „ *H. albicauda.*
a, c. Upper view; *b, d.* side view.

Skull rather stout and heavy, the muscular ridges, however, but little developed. Brain-case comparatively short, not half the length of the whole skull. Teeth more rounded than in the members of the typical subgenus. Last molars, above and below, proportionally much larger than in *Herpestes,* the lower one with a well-marked extra external cusp between the two usual ones, so that there are five cusps in all (see woodcut, Fig 1, *c, d.*). In old specimens, of course, this character cannot be made out, as the cusps are worn off these teeth at a comparatively early age. Dental percentage 71–84.

Dimensions.

	Head and body.	Tail.	Hind foot.
a. Type, Nubia (Berl. Mus.)	26·0	15·8	4·9
b. Natal	24·0	15·0	5·0
c. Caffraria (Leyd. Mus.)..	24·5	15·8	4·85
e. W. Africa (type of *H. loempo,* Leyd. Mus.)....	23·0	15·8	4·5

Skulls.

	Length.	Breadth.	Palate-length.	Palate-breadth.	Inc. to cross line.	Basi-cranial axis.
a. Accra..........	4·28	2·16	2·6	1·3	1·5	—
b. W. Africa (Berl. Mus.)..........	4·05	2·0	2·41	1·25	1·41	—
c. Abyssinia	3·75	1·88	2·05	1·11	1·35	1·18
d. E. Africa......	c. 3·80	2·07	2·23	1·2	1·37	—

Skull.

	Length.	Breadth.	Palate-length.	Palate-breadth.	Inc. to cross line.	Basi-cranial axis.
a. Natal......	1·82	1·13	·90	·63	·61	·65
b. ,, ...	..	..	·86	·61	·60	—

Of this species, the smallest of all the Mungooses, Dr. Sundevall obtained in the typical series a considerable number of specimens; but, curiously enough, no others have come to any of the Museums that I have seen, except specimen *b* measured above, which was obtained from Natal through a dealer. However, Dr. Sundevall distributed specimens so freely, that there are some of his original specimens of this species in most of the larger European Museums.

2. HELOGALE UNDULATA.

**Herpestes undulatus*, Peters, Reise n. Mossambique, p. 114, Taf. xxv. (animal and skull) (1852).

Hab. East Africa (Mozambique, *Peters*; Taita, *Hildebrandt*).

Size, compared with that of most *Herpestæ*, small, though slightly larger than *Helogale parvula*. Form slender. Tail rather shorter than the body without the head. General colour grizzled rufous, the longer hairs annulated with black and white; underfur for basal portion grey, terminal portion red. Neck, belly, and legs rich rufous, with less black grizzling. Tail coloured like back, no black tip.

Skull as in *H. parvula*, but larger, and the last molar smaller in proportion; dental percentage about 70.

Dimensions.

	Head and body.	Tail.	Hind foot.
a. Type, Mozambique (*Peters*)	9·4	6·7	1·56
b. Taita (*Hildebrandt*)........	9·9	6·4	1·48

Skull.

	Length.	Breadth.	Palate-length.	Palate-breadth.	Inc. to cross line.
a. Taita..........	2·0	1·24	·99	·68	·65

This species may be readily distinguished from *H. parvula* by its larger size and its bright rufous belly and underside of neck, these parts in *H. parvula* being a dull grizzled brown. I only know of the two specimens of which the dimensions are given above; so that I am not in a position to state what the full range of this form is.

Dr. Peters states that *H. undulata* is particularly fond of eggs, which it breaks by throwing them with its fore legs *through* its hind ones against a wall.

Molars of Helogale.

	P.M⁴.	M¹.	Percentage.
H. parvula.			
a.	5·0	4·0	80
b.	5·2	4·1	79
H. undulata.			
a.	5·6	4·0	71

darker, nearly black. Head greyish. Tail bushy, uniformly black brown.

Dimensions.

	Head and body.	Tail.	Hind foot
a. Type, Mozambique (very old) ..	20·8	9·1	3·25
b. Zanzibar (*Kirk*)	15·0	7·0	3·0

Skull.	Length.	Breadth.	Palate-length.
a. Type (from Peters)	3·4	2·1	2·1

This species, of which Dr. Kirk has sent us a rather small sp men from Zanzibar, is found further north than its ally *B. crassicau* Our specimen being in spirit, I have been able to examine caref the state of the feet with regard to the absence of the first toes; I find, as mentioned above, no trace whatever of these digits; w in species which normally possess five toes, and the first one i any case accidentally lost, there are generally some remains left of missing digit, in the shape of a broken metacarpal or metatarsal[2]

The species of this group would seem to be very rare, as I l seen no other specimens of either *B. crassicauda* or *puisa* bes the types of the two species in the Berlin Museum, and Dr. Ki one already referred to.

3. ? Bdeogale nigripes.

B. nigripes, Pucheran, Rev. et Mag. Zool. vii. p. 111 (1855)

Hab. W. Africa (Gaboon).

"*Major; corpore albescente; cauda candidissima; artubus nigr*

No dimensions of any sort are given.

Dimensions of Teeth of Bdeogale.

B. crassicauda.	P.M⁴.	M³.	Percen
a. Type (from Dr. Peters's figure)....	7·5	5·5	73
B. puisa.			
* Zanzibar (*Kirk*)	6·9	4·5	66

IV. Cynictis. Type

Cynictis, Ogilby, P. Z. S. 1833, p. 48.......... *C. penicil*

Range. That of the only species.

Toes 5—4[1]. Teeth, I. $\frac{3}{3}$, C. $\frac{1}{1}$, P.M. $\frac{4}{4}$, M. $\frac{2}{2} \times 2 = 40$. M with a distinct naked line from nose to upper lip. Hind soles hairy. Frontal portion of skull strongly convex, brain-case h A well-marked vacuity in the floor of the auditory meatus, consi of a more or less rounded hole, which, as the animal gets o

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[1] See above, p.61.

[2] Our only skeleton of this genus has not the smallest rudiment, even o metatarsal, of the hallux.

dark [illegible] from all its allies by
brown [illegible] greyish yellow colour.
[illegible] between the various for
[illegible] species. *C. leptura*, Smi
[illegible] slightly different from the re
[illegible] Museum, shows no charact
[illegible] form from the rest; moreov
[illegible] specimen, in other respects qu
[illegible] has as slender a tail as *C. leptur*
[illegible] the latter can stand as a spec

[illegible] his figure of *C. ogilbyi* in
[illegible] too long to quote here, of t
[illegible] said to inhabit dry and sandy plain
[illegible] ground, to which, however, it on
[illegible] the day in hunting for mice, sma
[illegible] the sun.

[illegible] of Cynictis.

[illegible]	[illegible]	MP.	Percentages.
[illegible]	[illegible]	5·1	63
[illegible]	[illegible]	5·0	66
[illegible]	[illegible]	5·3	59
[illegible]	[illegible]	4·6	57

V. RHINOGALE.

Type.

[illegible] S. 1864, p. 375 (woodcuts of
[illegible] . . . . *R. melleri*.
[illegible] species.
[illegible] Teeth, I. [illegible], C. $\frac{1}{1}$, P.M. $\frac{5}{4}$, M. $\frac{2}{2}\times 2=42$. No naked
[illegible] General form of skull rounded, without
[illegible] Palate deeply concave both transversely
[illegible] Teeth rounded, suited for grinding rather
[illegible] molars above and below proportionally very
[illegible] long as the first molar, and very possibly
[illegible] cusp; but the teeth are too much worn in
[illegible] for this point to be made out. Lower jaw
[illegible] (*cf.* original figures).
[illegible] somewhat remarkable one, having the general
[illegible] grooved-nosed Herpestines, while it has the
[illegible] generally rounded skull and dentition of the
[illegible] group. It is, moreover, quite peculiar among
[illegible] in possessing a distinctly concave palate, a
[illegible] separates it from all other Mungooses. I am
[illegible] present to which of the other genera *Rhinogale*
[illegible] presents such a mixture of characters that
[illegible] a satisfactory decision on this point is ex-
[illegible] at. However, it naturally falls into this
[illegible] used to arrange the other genera; so that we

Dr. Kirk has done so much to make the zoology of Zanzibar known to us, it seems on the whole more probable that this species does not occur there, but that the Zambesi is its proper habitat, especially as Dr. Meller was there considerably longer than he was at Zanzibar.

However, it is not very likely that it can be much longer before such a large and well-marked animal is again discovered; and then the question of locality will be satisfactorily settled.

Molars of Rhinogale.

		Upper P.M.^{4}.	M.^{1}	Percentage	Lower M.^{1}	M.^{2}	Percentage.
R. melleri	*a.*	7·5	5·5	73	6·4	6·4	100

VI. Crossarchus.

	Type.
Crossarchus, F. Cuv. Hist. Nat. Mamm. ii. livr. 47 (1825)	*C. obscurus.*
Ariela, Gray, P. Z. S. 1864, p. 565 (1864)....	*C. fasciatus.*
Mungos, Gray, P. Z. S. 1864, p. 575 (1864) (nec Ogilby[1]).......................... ...	*C. gambianus.*

Range. Africa south of the Sahara.

Toes 5—5. Teeth, I. $\frac{3}{3}$, C. $\frac{1}{1}$, P.M. $\frac{3}{3}$, M. $\frac{2}{2}\times 2=36$. No naked central line on nose. Hind soles naked. Skull depressed, as in *Herpestes*. Teeth rounded, without sharp cutting-edges. Vacuity in floor of auditory meatus oblong, in filling up often forming a row of small holes, as in *Suricata*. Last lower molar with an extra cusp in the centre of the outer edge, as in *Bdeogale* and the subgenus *Ichneumia*[2].

This genus includes four species, scattered over the continent of Africa. It is a matter of considerable interest to find that the three species placed by Gray under "*Mungos*," in a separate subfamily from *Crossarchus*, are not really generically distinct from the single species hitherto supposed to be the only member of this genus[3]. I can find no differences of importance whatever between these various forms; in fact *C. obscurus* resembles, at least in dentition, *C. zebra* and *C. gambianus* more than either of these do *C. fasciatus*. It is true that in our only skeleton of *C. obscurus* there is a certain amount of difference in the length of the hallux as compared with that of the other species; but an examination of a considerable number of skins does not show any constancy in this character,

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[1] Ogilby's genus was founded solely on the Cinghalese species *H. vitticollis*, Benn.; *H. gambianus* and *fasciatus* happening to be mentioned in the same paper, Gray took it as founded on them, and made another genus, "*Tæniogale*," to contain the Ceylon form.

[2] See p. 76.

[3] Since the above was written, Prof. Mivart has pointed out to me that the researches of Chatin into the structure of the anal glands of the Carnivora (Ann. Sci. Nat. 5th series, xix. p. 89, n., 1874) fully confirm the opinion here expressed as to the generic relationship of the striped Mungoose (*C. fasciatus*) with *C. obscurus*.

British Museum; but no others, so far as I am aware, have since been obtained.

3. CROSSARCHUS ZEBRA.

**Herpestes zebra*, Rüpp. N. Wirb. Abyss. p. 30, pl. ix. fig. 2 (animal), and pl. x. fig. 1 (skull) (1835).

H. gothneh, Fitz. & Heugl. S.B. Akad. Wien, liv. Abth. 1, p. 560 (1866).

H. leucostethicus, Fitz. & Heugl. t. cit. p. 561 (1861).

Hab. Abyssinia.

Size rather smaller than in the last species, and form slenderer. Tail half as long as the head and body. General colour grizzled grey, with cross bands on the posterior part of the back. Longer hairs ringed with black and pale yellow or white, without any rufous, the rings very narrow, so that the transverse bands are correspondingly narrow, five or more to the inch. Underfur dirty yellowish grey. Chin, chest, and belly more or less bright rufous, a sharp line along the sides of the neck separating the rufous from the grey of the upperside. Central line of the underparts generally white, this colour varying in quantity very much, sometimes extending all down the centre from chin to anus, sometimes nearly or quite absent. Tail-hairs ringed like those of the body, the black gradually predominating towards the tip, which is often quite black. Feet, in the same way, becoming blacker to the toes.

Skull as in *C. gambianus*. Teeth rather small, P.M^4 between 6 and 7 mm. long. Dental percentages 66–79.

Dimensions.

	Head and body.	Tail.	Hind foot.
a. Abyssinia (*Rüppell*) ……	13·5	7·0	2·3
b. ,, (skin) ……..	13·0	6·6	—

Skulls.

	Length.	Breadth.	Palate-length.	Palate-breadth.	Inc. to cross line.	Basi-cranial axis.
a. No locality ..	2·75	1·59	1·46	·95	·94	·97
b. ,, ..	2·7	1·5	1·43	·88	·89	·95
c. Bogos, Abyssinia[1] ….	2·42	1·35	1·26	·79	·80	·89

This species has hitherto been found only in Abyssinia, where Rüppell and others have obtained it in considerable numbers. It may readily be distinguished from the other striped Mungoose, *C. fasciatus*, by the narrowness and whiteness of the cross bands, and by the sharply defined rufous of its neck and chest.

I can see no reason for the separation of either *H. gothneh* or *leucostethicus* from the typical form, the characters given being quite unimportant.

It has already been mentioned that one of our skulls of this species possesses a third pair of upper molars behind the two normal ones. The presence of this extra pair of teeth however, is, shown to be of no specific or generic importance by the fact that in a second, quite identical, specimen collected at the same time and place (Bogosland, Abyssinia), there are only the two usual pairs of upper molars.

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[1] With third upper molars.

4. CROSSARCHUS FASCIATUS.

Viverra ichneumon β, Schr. Säug. iii. p. 430, pl. cxvi. (1778).

V. mungo[1], Gmel. Linn. S. N. i. p. 84 (1789).

Herpestes mungo, Desm. Mamm. i. p. 211 (1820).

H. fasciatus, Desm. Dict. Sci. Nat. xxix. p. 58 (1823).

**Ichneumon tænionotus*, Smith, S. Afr. Quart. Journ. ii. p. [illegible] (1835).

Ariela tænionota, Gray, P. Z. S. 1864, p. 565 (1864).

Hab. S.E. Africa (Caffraria to Mozambique[2]).

Size medium; form stout. Tail rather more than half as long as the head and body. General colour grizzled grey, the posterior half of the back with cross bands. Longer hairs ringed with black and yellow or dark rufous, the posterior half of each light ring being always rufous. The rings somewhat broad, so that the transverse body-bands are also broad, there being about 3½ to the inch, counting both light and dark bands. There are altogether about 12 or 13 bands; but they merge so gradually into the rest of the body-colour that they cannot be exactly counted. Underfur grey-brown. Neck, chest, and belly uniform grizzled grey, like the upper part of the head and shoulders, not rufous as in *C. zebra*. Feet and tail like body, but becoming gradually nearly or quite black towards their distal parts.

Skull comparatively broad and heavy, the teeth larger than in any other species, P.M.^{4} more than 8 mm. long, last molar small. Dental percentage 57–59.

Dimensions.

	Head and body.	Tail.	Hind foot.
a. Cape	13·0	8·0	2·8[illegible]
b. Natal (type of *I. tænionotus*)	12·0	7·0	2·4[illegible]

Skulls.

	Length.	Breadth.	Palate-length.	Palate-breadth.	Inc. to cross line.	Basi-cranial axis.
a. S. Africa (*Dr. Smith*)	2·84	1·67	1·51	·98	·99	1·05
b. S. Africa (*Dr. Smith*)	2·79	1·45	1·45	·92	1·00	·9[illegible]

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[1] This name is so utterly barbarous, and that of *H. fasciatus* so well known that I think we are justified in ignoring it and using Desmarest's classical and appropriate term.

[2] Two specimens, said to be "*Herpestes fasciatus*," are recorded from Angola in the 'List of Animals in Zool. Soc. Coll.' 1879, p. 62; but as neither of these is still living and nothing has been preserved of them, I cannot say whether they really belong to this species, to *C. zebra*, or to some undescribed form.

This species by its locality, and not *C. zebra*, no doubt represents the early-known "*Viverra mungo*," which was said to come from the "East Indies." No cross-striped Mungooses, however, are known from India, and the original specimens must have been obtained from the Cape. All the specimens with exact localities that I have seen come from the eastern parts of the Colony, and none from the western; so that we may suppose that its true range is very similar to that of *Herpestes pulverulentus*[1]. Probably, however, tame examples were sometimes brought down to Capetown, where they would be seen by the earlier travellers. Dr. Smith says of his *Ichneumon tænionotus*, "Inhabits Natal: rare."

Molars of Crossarchus.

		P.M⁴.	M².	Percentage.
		mm.	mm.	
C. obscurus	*a*...	6·2	4·8	77
	b...	7·0	5·0	71
	c...	6·5	5·0	77
C. gambianus	*a*...	6·0	4·8	60
C. zebra	*a*...	6·9	4·6	66
	b...	6·5	4·5	69
	c...	6·8	5·0	73
	*...	6·5	5·1	79
C. fasciatus	*a*...	8·7	5·2	59
	b...	8·0	5·2	57

VII. SURICATA.

	Type.
Suricata, Desm. Tabl. Méth. Mamm. in Nouv. Dict. d'H. N. (ed. 1) xxiv. (1804)	*S. tetradactyla.*
Rhyzæna, Illig. Prodr. Syst. Mamm. p. 134 (1811)	*S. tetradactyla.*

Range. That of the only species.

Toes 4—4[2]. Teeth, I. $\frac{3}{3}$, C. $\frac{1}{1}$, P.M. $\frac{3}{4}$, M. $\frac{2}{2}\times 2=38$. Hind soles naked. Nose produced. No central naked line from muzzle to upper lip. Fore claws very long, twice as long as the hind. Skull very broad, the zygomata strongly diverging backwards. Facial outline convex. Posterior part of skull very high, not compressed as in *Herpestes*, but more as in *Cynictis*. Teeth very similar to those of *Crossarchus*. First upper premolar absent, with no diastema in its place; first lower either present or, if absent, there is a distinct diastema. Auditory meatus somewhat prolonged, with the imperfection of the floor well marked, consisting of a line of minute holes, quite different from the large round hole found in this position in *Cynictis*[1].

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[1] See p. 74.

[2] In a skeleton and a specimen in spirit, I find the following rudiments of the 1st toes:—of the fore foot, in the spirit specimen, a rudimentary metacarpus, 2 mm. in length; in the skeleton, no trace of a hallux, but the above-mentioned rudiment might easily have been lost. Of the hind foot, in the spirit specimen, a hallucal metatarsal 2 mm. long and 2½ broad, and, in the skeleton, a similar rudimentary metatarsal and, in addition, a minute 1st phalanx (1½ mm. long and 1 broad).

1. SURICATA TETRADACTYLA.

Viverra suricatta, Erxl. Syst. Regn. An. p. 488 (1777).

V. tetradactyla, Schreb. Säug. iii. p. 434, tab. cxvii. (1778).

Mus zenik, Scopoli, Delic. Flor. et Faun. ii. p. 84 (1786).

Viverra zenik et *tetradactyla*, Gmel. Linn. Syst. Nat. i. p. 85 (1789).

Suricata capensis, Desm. Tabl. Méth. Mamm. (p. 15) in Nouv. Dict. d'Hist. Nat. 1st edit. xxiv. (1804).

Rhyzæna tetradactyla, Ill. Prodr. Syst. Mamm. p. 134 (1811).

Suricata viverrina, Desm. Nouv. Dict. d'Hist. Nat. 2nd edit. xxxii. p. 297 (1819).

Rhyzæna typicus, Smith, S. Afr. Quart. Journ. ii. p. 117 (1835).

Hab. Cape Colony (Algoa Bay, Cape, &c.).

Size small; form slender. Tail about half the length of the head and body together. Fur long and soft. General colour light grizzled grey, with black transverse bands across the posterior part of the back. Longer hairs broadly ringed with black and white, the white on the whole predominating; the transverse bands formed by the regular arrangement of the hairs, by which the white and black rings come opposite to each other on adjacent hairs. Underfur dark rufous. Head nearly white, except a distinct oblong black mark round the eyes. Ears black. Tail yellowish, with a well-marked black tip. Feet like body. Skull as described above. Dental percentage 70–79.

Dimensions.

	Head and body.	Tail.	Hind foot.
a. (In spirit) ..	14·0	7·0	2·4
b. S. Africa	15·0	7·5	2·5
c. ,, ...	14·0	8·0	2·5

Skulls.

	Length.	Breadth.	Palate-length.	Palate-breadth.	Inc. to cross line.	Basi-cranial axis.
a...	2·42	1·79	1·37	·90	·88	·74
b...	2·38	1·75	1·36	·84	·84	·76

This animal is a well-known Cape species: it seems to be confined to that colony; but I have seen so few specimens with exact localities, that I am unable to determine its precise range. It may always be readily distinguished from all other Mungooses by its elongated nose and claws and its peculiar coloration, especially its black ears, no other species having ears differing in colour from the rest of the head.

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[1] Prof. Flower, in his paper on the Classification of the Carnivora (P. Z. S. 1869, p. 20), says of this genus:—"Here, and here alone among the Viverridæ, there is a prolonged auditory meatus; but it presents the peculiarity of being fissured along the whole extent of the middle of its floor." It should, however, be noted that *Crossarchus* has a somewhat produced meatus, and that *all* the genera of this group have constantly a more or less fissured meatus-floor, individual skulls often exceeding *Suricata* in this respect.

Smuts says of its habits:—"This animal lives in various parts of the Colony, mostly in mountain caves; it is easily tamed and kept in a state of domestication."

Molars of Suricata.

		P.M^4.	M^2.	Percentage.
S. tetradactyla, *a*	....	7·0	5·0	71
,, *b*	....	6·3	5·0	79
,, *	....	6·5	4·8	74
,, *	....	7·0	5·2	74

4. Description of a New Species of Land-Rail from East Africa. By H. B. Tristram, F.R.S., C.M.Z.S.

[Received December 28, 1881.]

I have lately received from Mr. R. C. Ramshaw, a medical missionary who has been stationed for four years in East Africa, a small collection of birds, chiefly of Ploceidæ and Cinnyridæ, formed by him at Ribé, a little to the north of Rabai, and at Jomon, a district extending S. lat. 3°–5° and E. long. 39°–40°.

Among the specimens occurs a Land-Rail which both Mr. Sharpe and Capt. Shelley consider to be undescribed. I therefore venture to describe it as

CREX SUAHELENSIS, spec. nov.

C. *capite et regione parotica castaneis; collo superiore fusco; dorso inferiore nigricante; supracaudalibus castaneo marginatis; cauda nigricante, castaneo marginata; mento et thorace albis; pectore rufescente; abdomine albescente; crisso et subcaudalibus læte castaneis; scapularibus brunneis, quaque pluma albo marginata; remigibus nigrescentibus, pogonio externo remigis primi albo; subalaribus brunneis; rostro, tarsis et pedibus olivaceis. Long. tota* 9, *alæ* 3·92, *caudæ* 2·3, *rostri a rictu* ·85, *tarsi* 1·4, *digiti med.* 1·9.

Hab. Ribé, East Africa.

The white edgings to the scapulars and some of the feathers of the back seem to indicate immaturity. In other respects the bird has all the appearance of being adult: and the measurements certainly do not correspond to those of any known species.

5. Note on the Gall-bladder, and some other Points in the Anatomy of the Toucans and Barbets (*Capitonidæ*). By W. A. Forbes, B.A., Prosector to the Society.

[Received December 30, 1881.]

The statement has been made, and copied [1], that a gall-bladder is absent in the Toucans. The latest writer on the visceral anatomy of birds, Dr. Hans Gadow [2], describing the gall-bladder of the "Coccygomorphæ," says:—"*Rhamphastus* compensirt *das Fehlen der Blase* durch einen sehr langen (9 cm.) und weiten Ductus Choledochus" (*l. c.* p. 70).

On dissecting, therefore, some months ago a fresh specimen of *Pteroglossus wiedi*, I was considerably surprised to find a peculiarly long and tubular gall-bladder, which lay superficially, covering the other abdominal viscera and extending far down in the abdominal cavity, its fundus nearly reaching the cloacal region of the intestine.

My attention having been thus called to the point, I have since, whenever opportunity has offered, always looked for this viscus, and have now ascertained its presence in specimens of *Rhamphastos carinatus*, *vitellinus*, and *dicolorus*, *Pteroglossus wiedi* (3), *Selenidera maculirostris*, and *Aulacorhamphus prasinus*. The annexed drawing (fig., p. 95) will show its general form and relations, as seen in a fresh specimen of *Rhamphastos dicolorus*. In the specimen figured the total length of the gall-bladder was not less than 4·15 inches. The cystic duct originated ·85 inch from the liver, and was 1·7 inch long. In other cases the duct arises much nearer the portal fissure. Its presence, therefore, in all Toucans is nearly certain [3].

It is also present, of exactly the same general form, and with the same relations, in all the Capitoninæ I have examined as regards this point, namely *Megalæma virens* (a fresh specimen), *M. franklini*, and *Xantholæma rosea*. Its presence in *Indicator* in a similar form is almost certain, from the intimate relationship of that genus to the Barbets and Toucans. Unfortunately I can give no exact information on this point, the only specimen I have of an *Indicator* having been eviscerated.

The only other family of birds in which, so far as I am aware, the gall-bladder assumes this peculiar vermiform shape, and lies freely in the abdominal cavity, is that of the Picidæ. Nitzsch[1] describes the liver of the Woodpeckers (of which he examined *Gecinus viridis* and *canus*, *Dryocopus major*, *medius*, and *minor*, and *Picus martius*) as being "immer mit ausgezeichnet langer darmförmiger Gallblase;" and I can quite confirm this description as being

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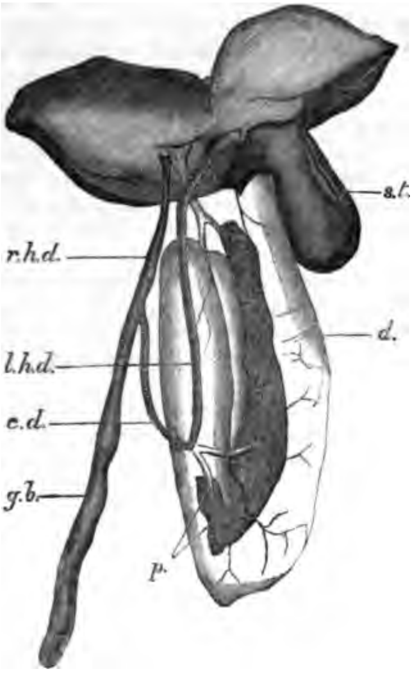
[1] Owen. Anat. Vert. ii. p. 177; Macalister, Morph. Vert. p. 194; Crisp, P. Z. S. 1862, p. 137.

[2] "Versuch ein. vergleich. Anatomie des Verdauungssystemes d. Vögel," Jen. Zeitschr. xiii. n. F. vi.

[3] It is but due to the late Prof. Garrod to say that he also had noted this peculiar gall-bladder, aptly characterized by him as "intestiniform," in several Toucans dissected by him, including *R. Cuvieri* and *carinatus* and *P. wiedi*. It is also, I find, correctly described by Meckel ('Traité général,' &c., Paris, 1838, t. viii. p. 289), as follows:—"La conformation de la vésicule est extrêmement curieuse chez le toucan (*Ramphastos*). Elle y est d'une longueur si énorme, qu'elle occupe la cavité abdominale toute entière: elle est très rétrécie, et ressemble plutôt à un cæcum qu'à une vésicule." I made my first observations unaware of either of the above facts.



Liver, stomach, duodenum, &c., of *Rhamphastos dicolorus*, from in front, showing the peculiar intestiniform gall-badder (*g. b*).

St., stomach; *d*, duodenum; *p*, pancreas; *r. h. d*, *l. h. d.*, right and left hepatic ducts; *c. d*, cystic duct.

applicable to the last-named species. Garrod also correctly noted, in his MSS., the "long intestiniform gall-bladder" of *Gecinus*. The similarity, therefore, in this respect of the Capitonidæ[2] to the Picidæ strengthens the many arguments for the intimate relationship of these two groups. And I may take this opportunity to point out some further peculiarities which these birds have in common with each other. These are:—

(1) The great extent of the deltoid muscle, which extends down the entire length, or very nearly so, of the humerus, and is inserted

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[1] In Naumann's Orn. Deutschlands, v. p. 252.

[2] I use this term, with Garrod (Coll. Papers, p. 464) to include the Toucans and *Indicator*, as well as the true Barbets.

by a tendinous slip into a small tubercle on the external surface of that bone, close to the elbow, and just above the tubercle for the tendon of origin of the *extensor metacarpi radialis longior* muscle. This is common to the Picidæ, *Indicator*, and the Toucans and Barbets. As long ago noticed by Nitzsch[1], this peculiarly long deltoid also occurs in the Passeres; but its similar condition in the Capitonidæ has not, I think, before been observed. But, as showing that the similarity in this respect of the Passeres to the Picidæ and their allies is not *necessarily* a mark of relationship, I may add that in some other birds, as, e. g., *Carpophaga*, *Ptilopus*, and *Cariama*, the deltoid is nearly the same in size and shape, extending down to very near the elbow.

(2) The presence of a distinct ossicle, of the nature of a sesamoid, the so-called "*scapula accessoria*," which is developed in the scapulo-humeral ligament of the shoulder-joint, and plays over the posterior angle of the humerus-head. From it arise some of the fibres of the deltoid.

Nitzsch, with his usual accuracy[2], had also noticed the existence in the Picidæ of this bone, which, as is well known, occurs also in the Passeres; but the relationships of the bone in the last are not the same as they are in the Picidæ, *Indicator* and other *Pici* I have examined.

In the Passeres the bone in question becomes connected with the tendon of the *pectoralis secundus* muscle as this courses over the head of the humerus towards its insertion, sending round it a special thin tendinous loop, in which the tendon of that muscle plays. Hence, in the undisturbed position of these parts, the *pectoralis* tendon is seen to be somewhat L-shaped, the angle of the L being at the place where it is connected by this fibrous loop to the sesamoid bone, and so dragged backwards out of a direct course.

In the *Pici* I have been able to find no such connection between the *scapula accessoria* and the *pectoralis secundus* tendon, which remains quite free from it throughout its course.

The additional points of resemblance detailed in the present communication render the near relationship of the Picidæ to the Capitonidæ even more certain than before. Nitzsch, from pterylographical grounds, and Kessler[3], from osteological ones, long ago pointed out this connection, which was afterwards remarkably confirmed by Garrod's observations on their myology and visceral anatomy.

The fact that there should be important cranial differences between the two groups (and even amongst the members of one of these) only shows that the cranial structure of a bird may be profoundly changed, in accordance with its conditions of existence, whilst in the rest of its organs no change whatever is effected; and such a fact must of itself tell heavily against the view that the structure of the skull in birds is of itself alone a certain, or even sufficient, index to their systematic classification.

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[1] Zeitschr. f. ges. Naturwiss. 1862, xix. p. 400.

[2] Tom. supra cit. p. 389.

[3] Bull. Soc. Imp. Nat. Moscou, xvii. pp. 333–334, 340.

differ but little from those of a bird. Notwithstanding the massiveness of the skull, nearly every suture is persistent; in the light skull of the Bird nearly every suture is obliterated.

"The pier of the mandible explains, and is explained by, that of the Lizard on one side, and the Salamandrian below. The jaw itself is at an early period quite continuous with the hyoid arch; and that arch is for a time continuous with the auditory *columella*, as in the *Hatteria* of New Zealand; and the columella itself is only a modified part of that arch. In its early segmented state, however, and in its later broken-up condition, it comes very near to what is found in the mammal, and greatly helps the morphologist in working out a harmony between this arch in the Sauropsida and the Mammalia.

"In the discussion which took place a dozen years ago between Professors Peters and Huxley (for the views of the latter see P. Z. S. 1869, pp. 391–407), as to the early continuity of the mandibular and hyoid arches and their nature, both combatants were right and both were wrong. The two arches *are* continuous for a time; but that condition does not sustain Prof. Peters's *reasoning*. The deductions of Prof. Huxley, in spite of the fact that he worked with imperfect materials, will remain true for all time."

Prof. Parker's memoir will be published entire in the Society's Transactions.'

The following papers were read:—

1. On a Collection of Rodents from North Peru. By OLDFIELD THOMAS, F.Z.S., British Museum.

[Received December 15, 1881.]

(Plate IV.)

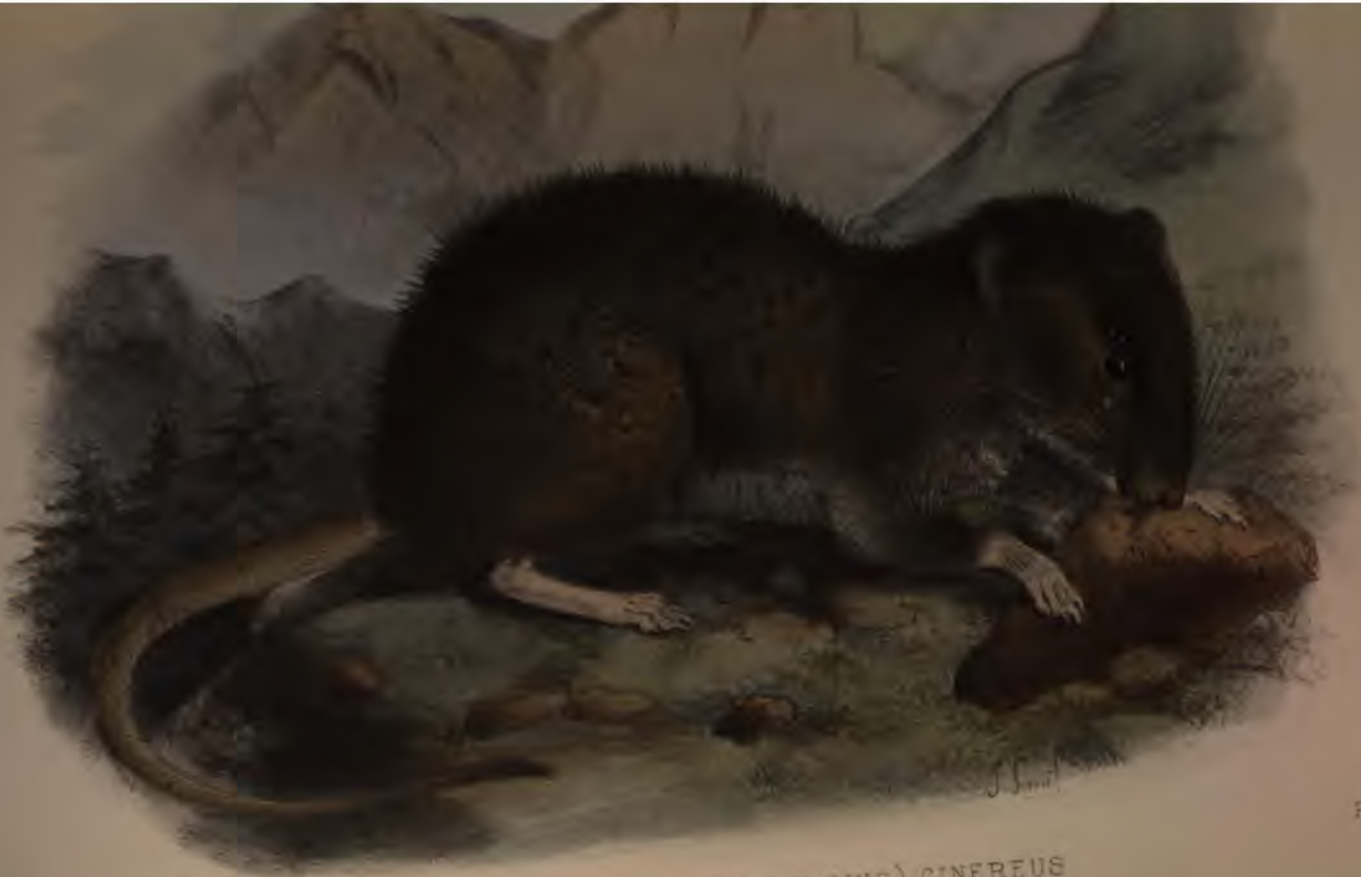
The collection now described was obtained by M. Stolzmann, the well-known Polish collector, in Northern Peru, and has been placed in my hands for determination by Prof. Taczanowski, of the Warsaw Museum, by whom a nearly complete set has been presented to the British Museum.

Every specimen has its exact locality, date, and altitude recorded; and the habits of many of the species have been noted by M. Stolzmann, whose remarks, placed between quotation-marks, are appended to their respective species.

The localities from which the collection was obtained are as follows:—

Tumbez.—Capital of the province of the same name. Situated on the river Tumbez, at about 4 miles from its outlet in the Bay of Guayaquil (3° S. lat.).

Tambillo.—A colony on the river Malleta, a tributary of the Upper Amazons. This river forms the boundary between the pro-



Hanhart imp.

HESPEROMYS (RHIPIDOMYS) CINEREUS

J. Smit lith.

nazon under the name of Chamaya.

imoto[1].—A colony in the valley of the Huayabamba, a tributary
Huallaga, in the province of Chachapoyas. It is about 5400
ove the sea, upon the eastern slope of the eastern chain of
rdilleras (6° S. lat.).

mbo[1].—A plantation in the forest of the same name, to the east
ıchapoyas and Chirimoto, 3700 feet in altitude, on the banks of
er Huambo, a tributary of the Huallaga.

these localities, except Tumbez, are on the northward
n extension of the Patagonian subregion, as defined by
s. Newton and Salvin[2]; so that we should naturally expect, as
turns out to be the case, that most of the species would be
me as those found by Mr. Louis Fraser, who collected at
situated in the Ecuadorean part of this same Andean tract.
ez is on the southward extension of the Subandean subregion on
cific side; but the specimens collected there are too few to
ny deductions from.

chief interest of the collection centres in the fine series of
romys contained in it; for of this difficult genus and the closely
one *Holochilus* M. Stolzmann obtained just over 40 speci-
The value of this additional material may be perceived when
remembered how very few of the specimens in the various
ms are preserved in spirit, or have their exact localities or
recorded.

account, therefore, of the fact that most of the published de-
ons have been taken either from stuffed specimens or skins,
thought it useful to give the measurements of every adult
en in this collection, even when belonging to compara-
well-known species. It must, moreover, be remembered that
such a locality as Northern Peru very few species of this
can in any sense be called well known; in fact, of the 11
of *Hesperomys* and *Holochilus* here described, only two, *Hes-
ys longicaudatus* and *olivaceus*, at all deserve this term; and
f these, additional measurements are much to be desired, as

peromys now usually admitted. Of these *Calomys* claims four species, one being new; *Rhipidomys* also four, of which two are new; and *Habrothrix* the remaining two, both of which are previously-known species. There are thus three new species in the collection; and of two of the others I am somewhat doubtful of the determination; so that I think it possible that either or both of them will in the end turn out to be really different from the species to which I have provisionally referred them.

The chief previous information bearing on this subject is comprised in Tschudi's classical work on the fauna of Peru[1], and in Mr. Tomes's papers on the Mammals collected in Ecuador by Mr. Fraser[2].

Of the 6 Muridæ mentioned by Tschudi, only one, *Hesperomys leucodactylus*, was found by M. Stolzmann; while of the 13 brought from Ecuador by Mr. Fraser he obtained six, or just about half; so that from his well-preserved spirit-specimens I have been able to supplement the descriptions given by Mr. Tomes, many of which were drawn up only from skins.

It is perhaps well to mention that, when describing these Rats and Mice, I found it possible, owing to their excellent state of preservation, entirely to dry the hairs, so that the colour and texture of the fur, and the general appearance of the animals were just as they would have been if the specimen had been examined when recently killed. I have been unfortunately unable to supplement from this collection the notes recently published by me with regard to the comparative lengths of the different parts of the alimentary canal[3], because the intestines had been removed from all the specimens before they came into my hands.

Of the new species obtained by Mons. Stolzmann, *H. spinosus*[4] is perhaps the most interesting, as being the first *Hesperomys* that has been found with spiny fur. I have long expected that such a form would be discovered. There are so many examples of tropical species of the neighbouring genus *Mus* which possess spines in their fur, that I have always been surprised at there being no spiny members of such a large and variable tropical genus as *Hesperomys*. The present discovery of a spine-clad Vesper-mouse is therefore proportionately interesting.

As in the Old-world *Mus*[5], so here in *Hesperomys*, I find that the number of mammæ is both very constant[6] and very distinctive of the various subgenera and species, though the value of this character seems never to have been noticed by any previous writer in connexion with the arrangement of the Sigmodont Muridæ.

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[1] Pp. 177-184 (1844)

[2] P. Z. S. 1858, p. 546; 1860, pp. 211 & 260.

[3] P. Z. S. 1880, p. 696.

[4] *Infrà*, p. 105.

[5] See P. Z. S. 1881, p. 531, &c.

[6] The variation in the number in some of the common species of *Mus*, viz. in *M. decumanus*, *rattus*, and *alexandrinus*, has caused this character to fall into disrepute among writers on Rodentia; but, with the exception of these species, and of one or two others which have the unusually large number of from 14 to 18 mammæ, I have never, in any single instance, found a specimen of either *Mus* or *Hesperomys* in which the number differed from that normal to the species. I do not of course assert that individual variations do not occur, but only that they must be extremely rare, as I have never met with any in all the large series of specimens that I have examined with special reference to this point.

The following Table gives the number of mammæ found in a few of the best-known Sigmodontes not included in the present collection:—

	Pectoral pairs of mammæ.	Inguinal.	Total mammæ.	Nr. of adult females examined.
Ochetodon mexicanus, *De Sauss.* ...	1	2	6	1
Hesperomys (Rhipidomys) sumichrasti, *De Sauss.*	0	2	4	8
H. (Vesperimus) leucopus, *Raf.* ...	1	2	6	6
H. (V.) michiganensis, *Aud. & Bach.*	1	2	6	1
H. (Oryzomys) couesi, *Alst.*	2	2	8	2
H. (Calomys) bimaculatus, *Waterh.*	2	2	8	1 (type)
Sigmodon hispidus, *Say & Ord* ...	3	2	10	7

We thus see that the number of mammæ gives us an additional character by which to separate Dr. Coues's subgenus "*Vesperimus*" from *Calomys*, the first having only 3, while the latter has 4 pairs. *Sigmodon* also, on whose generic distinction Dr. Coues has cast some doubt[1], is, so far as its mammæ are concerned, very distinct from any of the other New-world Muridæ in having no less than 5 pairs, the largest number found in this group.

1. LEPUS BRASILIENSIS, L.

a (juv.). Cutervo, 9000′, Feb. or Mar. 1879.

2. ECHINOMYS SEMISPINOSUS, Tomes, P. Z. S. 1860, p. 265.

a. ♂ (imm.), Tumbez, sea-level, June 1876.

"In the reeds (*Canna brava*) on the banks of the river."

[MUS MUSCULUS, L.

a. Callacate, 4800′, April 1879.

This specimen had a large *Œstrus*-larva in the flesh just above the root of the tail (See C. O. Waterhouse, Proc. Ent. Soc. 1881, p. xxii).]

3. HOLOCHILUS (NECTOMYS) APICALIS, Peters, Abhandl. Akad. Berl. 1860, p. 152.

Hesp. cephalotes, Desm., Tomes, P. Z. S. 1858, p. 548 (nec Desm.).

a. Chirimoto, 5400′, Jan. 1880.

b. Huambo, 3700′, April or May 1880.

c, *d* (juv.). Tambillo, 5800′, Feb. 1878.

Dimensions, in inches:—

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear-conch, length.	Muzzle to ear.
a. ♂ ..	7·5	9·0	1·96	1·96	·68	1·58
b. ♂ ..	8·4	10·1	2·05	2·15	·65	1·77

In the paper quoted above, Prof. Peters described a large Guayaquil Rat as *Nectomys apicalis*, g. and sp. n., the genus being founded on the presence of short webs to the toes, including *H. squamipes*, Bts., from which *N. apicalis* was separated on account of its only having 5 instead of 6 hind-foot pads. I do not, however, think that the presence of webs to the feet is a character of generic importance, and should prefer to regard *Nectomys* as only a subgenus of *Holochilus*. The specific distinction of *H. apicalis* is, no doubt, quite correct, as all the specimens in the present collection agree in having only 5 hind-foot pads. None of them have, however, the white tip to the tail described by Prof. Peters; but this is no doubt a point in which there may be considerable variation. The incisors of *H. apicalis* were originally said to be snow-white; but the present specimens do not agree with this, their incisors being pale yellow; but they are certainly very much lighter-coloured than in *H. squamipes*, where they are a rich orange. Notwithstanding these differences, I do not think there can be any doubt that these specimens belong to Prof. Peters's species, as they agree perfectly in size, locality, and the very important character of the number of the foot-pads.

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[1] Mon. N. Am. Rod. p. 32, 1877.

There is in the British Museum another specimen of this species, collected by Mr. J. K. Salmon at Concordia, Medellin, U. S. of Colombia.

(*a*) "Appeared to be aquatic, although caught in a cultivated field."

(*b*) "Killed in an arm of the river just as it was seizing a branch of a Guava-tree, which touched the surface of the water. It had in its stomach an aromatic mass composed of fruity substance. It swims perfectly, only coming out late in the evening, and is probably the animal which gnaws the fish taken in the Indians' nets. It is not possible to catch it in a rat-trap."

4. HESPEROMYS (CALOMYS) LATICEPS, Lund, Blik p. Bras. Dyrev. iii. p. 279 (1841).

a–c. Huambo, 3700', April and May 1880.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear-conch, length.	Muzzle to ear.
a. ♂ ..	5·0	6·3	1·35	1·44	·70	1·14

To this species I refer three specimens, of which, however, only one is adult. The tarsus seems to be somewhat longer than in the original specimens; but otherwise it agrees very fairly with a specimen of *H. laticeps* in the Museum collection from the original locality, Bahia. This Bahian specimen, however, is only a skin; and it is therefore quite possible that spirit-specimens would show such differences from the Peruvian one, that, combined with the greater length of the tarsus and the difference in locality, a new species would have to be formed for the latter.

The following is a description of the adult individual, a male:—

Fur rather short and close, compared with that of *H. albigularis* or *leucodactylus*. General colour above dull brown, very finely foot no less than 14 lines in length, while the very largest specimen in our considerable series of this species has a hind foot barely 1 inch long. I am therefore inclined for the present to continue to use Bennett's well-known name, believing that *H. longitarsus* may be found to be only the young form of some larger species.

7. HESPEROMYS (CALOMYS) SPINOSUS, sp. n.

a, b. Huambo, 3700′, April and May 1880.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear-conch, length.	Muzzle to ear.
a. ♂ ..	3·0[1]	3·85	·87	·95	·50	·78
b. ♂ ..	3·0	3·95	·87	·94	·46	·75

	Total length	Greatest breadth.	Molar series.	Back of incisors to 1st molars.	Breadth of constriction between orbits.	Lower jaw (bone only).
Skull of *a*..	·91	·51	·13	·22	·19	·50

Fur of medium length, composed of flattened spines intermixed with fine hairs, the spines predominating on the back but becoming rather fewer on the sides and disappearing on the belly. General colour above dark grizzled rufous and black, the spines slate-coloured, with black tips, the hairs also slate-coloured for the greater part of their length, but their tips rich orange. Sides becoming paler towards the belly, where the tips of the hairs in one specimen are white, and in the other pale fulvous, the bases of the hairs, however, being, as usual, slate. Head like back, but with fewer spines. Ears thinly covered with short black hairs. Tail at its base dark brown above and white below; but the two colours soon merge into uniform blackish brown; the scales proportionally very large. Tail-hairs very scanty, except at the tip, where they form a slight and inconspicuous pencil. Fore feet dark brown, the toes slightly paler. Hind feet and toes pale greyish white, not sharply separated from the colour of the legs, with a brown patch on the distal part of the metatarsus. Foot-pads small but prominent, soles smooth on proximal and granulated on distal halves. Fifth hind toes, without claws, reaching barely to the middle of the first phalanx of the fourth toes. Ears with a well-marked projection on their anterior edge. Both the specimens being males, I cannot record the number of mammæ; but the other characters being so similar to those of ordinary *Calomys*, it is unlikely that there would be any other number but 8.

Skull on the whole similar to that of other small *Calomyes*, but with the supraorbital ridges sharper and more strongly developed than in any others that I have seen, and the space between the orbits broader than usual.

The discovery of this Mouse, as spiny as an average *Heteromys*, is, as mentioned above, of great interest; for hitherto no spiny *Hespero-*

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[1] Taken before the skull was extracted.

mys has been recorded[1], notwithstanding the tropical climate of central and northern South America and the innumerable forms into which the Vesper-mice have been developed.

Among the Old-World Muridæ instances of the development of spines are extremely numerous, though their presence would seem often to be variable, the spines being apparently shed and renewed according to the season of year[2]. In the case of this Peruvian Vesper-mouse, however, it is scarcely likely that there could be any shedding of spines according to season, since at Huambo, only 6 degrees south of the equator, there can be but very little appreciable change of season at all. Moreover, as far as regards the distinctness of this species, there appears to be no *Calomys* as yet described with the colours and proportions of *H. spinosus*, even if we ignore the presence of the spines as a specific character.

8. HESPEROMYS (RHIPIDOMYS) LEUCODACTYLUS, Tschudi, Fauna Peruana, p. 183, Taf. xiii. fig. 2 (1844).

H. latimanus, Tomes, P.Z.S. 1860, p. 213.

a. Huambo, 3700′, April or May 1880.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear-conch, length.	Muzzle to ear.
a. ♀ ..	4·85	6·5	1·1	1·4	·5	1·17

The single specimen of this species is rather paler-coloured than Tschudi's type, which I have examined in the Berlin Museum; it is otherwise, however, quite identical, all the more important characters agreeing exactly. The following is a short description of Mons. Stolzmann's specimen:—

Fur soft and close. General color above pale brownish grey, below white. Dark colour of the back continued down to the metacarpals and metatarsals; toes white. Ears without a projection on their anterior edge. Tail quite unicolor, dark brown, with the hairs increasing in length to its tip, where they form a distinct pencil. Feet remarkably short and broad, sole-pads very large, round and smooth. Fifth hind toes reaching to the middle of the second phalanx of the fourth toes. Whiskers very numerous, black. Mammæ six, one pectoral and two inguinal pairs.

"Several individuals of this species were caught on the palmwood roof of the house in which I was living. They gnawed to pieces all leather articles, such as saddles and bridles, and used the fragments to build their nests with. One of these, made of paper torn from a book, was built in the folds of a mosquito-net."

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[1] Lund (Blik p. Bras. Dyrev. iii. p. 277, 1841) described a *Mus setosus* from Minas Geraes as having spines in the fur; but this is now generally admitted to have been founded on a specimen of *Mus alexandrinus*, Geoff., an introduced species which seems to be very common in Brazil.

[2] Cf. P. Z. S. 1881, p. 540.

Mammæ 4 or 6. Skull with more or less well-marked supraorbital ridges.

The most peculiar member of the subgenus is *H. sumichrasti*, De Sauss.[1], upon which both that author's *Nyctomys* and Tomes's *Myoxomys*[2] were founded[3]. These names must, however, both stand as synonyms of *Rhipidomys*, Tschudi, *H. leucodactylus* certainly belonging to the same subgenus as *H. sumichrasti*[4]. It is true that whereas the ordinary S. American *Rhipidomyes* are distinguished from true *Hesperomys* by having only 6 mammæ, *H. sumichrasti* outdoes them all in this respect by having only 4[5], and in other ways is the most markedly specialized of them all; but nevertheless the difference is only in degree, and not in kind, so that I think we are justified in amalgamating *Nyctomys* with *Rhipidomys* as but one subgenus.

There are, however, in addition to the well-marked species already referred to, three at least which, while they possess in different degrees some of the essential characters of *Rhipidomys*, yet are more or less intermediate between the true *Hesperomys* and the most typical members of this subgenus. The first of these is *H. bicolor*, Tomes[6], the position of which, however, I cannot properly determine, not having seen a specimen. The other two are those next following, both new to science, of which *H. taczanowskii* would seem to be most nearly allied to *Rhipidomys*, notwithstanding its rounded supraorbital margin and untufted tail, and *H. cinereus* the least, having, in addition to these two last-mentioned characters, feet proportionally longer, with less Rhipidomyine foot-pads, and a more or less bicolor tail. Notwithstanding these differences, however, I prefer for the present to call these both *Rhipidomys*, as they have only three pairs of mammæ, a number characteristic of the ordinary members of that group.

10. H. (Rhipidomys) cinereus, sp. n. (Plate IV.)

a. Cutervo, 9200′, February or March 1879.

	Head and body[7].	Tail.	Hind foot.	Forearm and hand.	Ear-conch, length.	Muzzle to ear.
a. ♀ ..	4·75	5·0	1·14	1·38	·64	1·18

Skull-dimensions.

	Total length.	Greatest breadth.	Molar series.	Back of incisors to 1st molar.	Breadth of constriction between orbits.	Lower jaw (bone only).
a. ..	1·3	·73	·22	·37	·19	·78

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[1] Rev. et Mag. Zool. 1860, p. 107.

[2] P. Z. S. 1861, p. 284.

[3] See Alston, Biol. Cent.-Am., Mamm. p. 143, 1880.

[4] Mr. Tomes himself, when first describing *Myoxomys*, placed in it, besides *H. sumichrasti* (its type and most typical species), *H. latimanus*, Tomes (= *H. leucodactylus*), and *H. bicolor*, Tomes.

[5] See above, p. 101.

[6] P. Z. S. 1860, p. 117.

[7] These measurements were taken before the skull was extracted.

above and beneath, uniformly thinly clad with brown hairs. Feet white, with a faint admixture of brown on the metacarpus and metatarsus. Foot-pads large and rounded, as in the typical *Rhipidomys*. Fifth hind toes as in *H. cinereus*. Mammæ 6, one pectoral and two inguinal pairs. Ears without a projection on their anterior edge. Incisors and supraorbital margins as in *H. cinereus*.

I have much pleasure in naming this peculiar species after Prof. Taczanowski, to whose kindness I am indebted for the opportunity of working out this interesting collection of mammals. *H. taczanowskii* may be readily distinguished from the last species by its much smaller size, and from its other near ally, *H. bicolor*, Tomes, by the fact that that species has a much shorter tail (3·5 in.), shorter hair, and a pure white belly.

12. HESPEROMYS (HABROTHRIX) OLIVACEUS, Waterh.

Mus (*Habrothrix*) *olivaceus*, Waterh. P. Z. S. 1837, p. 6.

Hesperomys renggeri, Waterh. Zool. Voy. Beagle, ii. p. 57, pl. xv. (1839).

a, *b*. Tumbez, sea-level, June 1876.

c. Callacate, 4800′, April 1879.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Muzzle to ear.	Ear-conch. length.
a. ♂....	3·7	3·14	·87	1·05	·93	·63
b. ♂ (imm.)	3·0	2·75	·86	1·0	·86	·60
c. ♀....	3·8	2·65	·79	1·0	·94	·56

This species seems to be a very common one all along the western parts of S. America; for, in addition to these Peruvian examples, the Museum contains a considerable series of specimens from Bolivia and Chili, including the types of the species, collected by Mr. Darwin during the voyage of the 'Beagle.' Mr. Tomes also records it from Ecuador.

It will seen by the dimensions given above that the Callacate specimen has somewhat shorter ears, feet, and tail than the others, while it has a larger body and head; and it has also rather thicker and softer fur. It seems very probable, however, that these differences are only owing to the much greater altitude at which it was obtained, since it is a well-known law among mammals that individuals from colder climates have a tendency to have larger bodies and shorter extremities than those of the same species living in warmer places.

13. HESPEROMYS (HABROTHRIX) CALIGINOSUS, Tomes, P. Z. S. 1860, p. 263.

a–f. Huambo, 3700′, April and May 1880.

	Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear-conch, length.	Muzzle to ear.
a. ♂..	4·0	2·9	·84	1·07	·52	·96
b. ♂..	3·9	3·01	·85	—	·51	·98
c. ♀..	3·5	3·0	85	1·05	·52	·92

2. On the Variability of Plumage exhibited by the Red Grouse (*Lagopus scoticus*). By T. E. Buckley, B.A., F.Z.S.

[Received December 27, 1881.]

At the commencement of this paper I wish to remark that I do not propose to speak of what are commonly termed varieties, such as albinos, melanisms, &c., but of such variations in plumage as I think may be met with by any one in a season's grouse-shooting, only specifying that they should be obtained late enough in the season for the birds to have attained the highest perfection of plumage, which would be by November.

Although many authors have remarked on the variations of the plumage of the Red Grouse, it seems to have been generally supposed by them that these variations had reference to the locality or district inhabited by the birds. Thus Yarrell writes (Br. B. ed. 3, ii. p. 368):—"The Red Grouse of N. Wales are said to be large in size and light in colour; those of the Western Highlands are also light in colour, and are said to be earlier breeders than those of the eastern parts of Scotland, which are, however, of large size and dark in colour." Mr. Gray writes (B. West of Scotland, p. 234), in reference to examples from the Hebrides, that "they may be said to be smaller and lighter in colour than those from moors on the mainland, especially the mountain-ranges of the north-east of Scotland, which invariably yield, in good seasons, the largest and most beautifully marked Grouse. In many districts the native Grouse partake of the coloration of the ground in their markings: thus the finest and darkest birds are those frequenting rich heathy tracts; while on broken ground of a rocky character, such as may be seen in the south of Wigtonshire, the Grouse are either more or less mottled, or are altogether lighter in colour, and less in weight." The same gentleman adds in a note, on the information of Mr. Elwes, "that in the district of Gareloch, west of Ross-shire, Grouse vary very much in the breast-markings." Mr. Colquhoun, on the same subject writes ('The Moor and the Loch,' 3 ed. p. 112):—"The Perthshire Grouse are much smaller and darker in colour than those of Argyllshire. The West Highlander is a beautiful rich red and very large. . . . In the low corn-districts, such as Lanarkshire, Renfrewshire, and the Border counties the Grouse are a light brown, borrowing a tint from the stubbles o which they delight to feed. . . . All these birds are so light i the colour as more nearly to resemble Partridges." Mr. Dresse (B. of Europe, vii. p. 166), after describing some specimens, make this observation:—"The Grouse differ somewhat in colour accordin to locality. Judging from the series I have before me, I consider th those from Scotland are somewhat the larger, and considerably dark in colour. Those from the north of England are more rufous; a the Irish bird is considerably the lightest, and has a yellowish r tinge in the plumage; the feathers on the legs are also darker a yellow-speckled hens breed in this mixed grass and heather, while the more ordinarily marked ones, such as No. 8, breed in the heather alone; but later on in the season, when the coveys begin to break up, the birds no longer entirely inhabit the ground that suits their plumage best. And here I may remark on a habit of the Red Grouse that I have not seen noticed elsewhere, which is that as the season advances the sexes separate, the cocks going singly or in twos, or at the most threes, the hens in larger numbers, except a few pairs here and there, which I believe to be barren birds.

Every ornithologist who has tried it must have remarked how difficult it is to get specimens of Ptarmigan in any of their three distinct plumages, at least in the British Isles; and I find, though in a less degree, the same may be said of the Red Grouse, as in nearly all of the specimens exhibited traces of their summer or autumn plumage may be found, though most of them were obtained near the end of the season. I do not pretend to call the one exhibited a perfect series, as almost every Grouse varies more or less from its neighbour; and it would not be easy to get two birds resembling each other in every feather, as may be done in most other species.

Having made these prefatory remarks, I now proceed to describe in detail some of the birds in the series now exhibited, nearly all of which were obtained at or near Balnacoil in the valley of the Brora, East Sutherland, and, whether cocks or hens, had completed their full winter plumage as far as it can be.

No. 1. *Male*, Nov. 7, 1879.—Head and neck reddish brown, the back of each being marked by irregular bars of black relieved by others of yellowish brown. Back deep reddish brown, closely interlined by very small and irregular lines of black, these lines being much coarser near the centre of the back. Wing-coverts, rump, and upper tail-coverts the same, but the black lines still smaller; primaries slightly edged with white. Breast deeper in colour than the back, getting darker still towards the centre, the feathers being marked throughout by fine black lines, a few white feathers appearing between the legs.

No. 2. *Female*, Nov. 7, 1879.—This bird (which with the one last described made a barren pair) resembles No. 1 in most particulars; the back has fewer black bars in it, but more dark spots; and the upper tail-coverts are more marked with black bars and spots. The breast is decidedly lighter in colour, and has the dark bars more regular; a few of the under tail-coverts are tipped with white.

This pair are good examples of the typical form of Red Grouse, one of the least common on the moor where they were procured.

No. 3. *Male*, Oct. 31, 1879.—Head and back of neck dark brown, relieved with lighter spots and black bars. Back reddish brown, with small black bars, each feather having a black patch; greater wing-coverts the same, but with fewer black patches; one or two of the lesser wing-coverts have a tip of white; upper tail-coverts dark brown with black bars, a few of these tipped with white. Throat deep chestnut-brown; breast deep reddish brown with decided bars colour. Back very black, the feathers edged and barred with dark brown, greater wing-coverts black, with here and there slight brown markings; upper tail-coverts very dark brown with lighter brown marks, shading to nearly pure black at the tail. Chin black, throat very deep reddish brown; breast black, some of the feathers slightly edged with brown, which turns to white at the centre of the breast, the sides showing more decided brown markings; under tail-coverts same as sides, but the markings more distinct still.

This bird approaches to a melanism; but as I have often come across specimens closely resembling it, I have described it as a type of one of the variations.

No. 8. *Female*, Dec. 3, 1879.—Back of head and neck light brown, marked with black bars and spots. Back, greater and lesser wing-coverts, and tail-coverts light brown marked with black bars, some of the feathers having black spots; the tips of many of the feathers again have a very light brown spot, giving it a very mottled appearance. Outer edges of primaries slightly marked with white. The whole of the breast, sides, and under tail-coverts light brown, shading to darker brown in the centre, each feather having one or more black bars—the feathers in the centre and sides also being edged with white, as are also the under tail-coverts.

This and No. 4 most nearly resemble each other, the latter being probably the older bird.

Now I think it will be admitted that the specimens I exhibit should not be, as I maintained before, regarded as "varieties" in the vague and ordinary sense of that word. It seems to me that we should regard them as instances of individual differences or polymorphisms—just as in the case of the Ruff (*Machetes pugnax*), which exhibits a degree of variability in its seasonal adornment more conspicuous, I allow, than that of the Grouse now before us, but far less permanent, since the difference in the Grouse would appear to remain, if not throughout the year, for at least several months, while that in the Ruff is confined to but a few weeks in the spring or early summer. Thus, if my contention be just, we have in the Red Grouse—the only species of birds according to the opinion of most ornithologists which is peculiar to the British Islands, and the species which in the judgment of the best authorities is itself the modified descendant of a far more widely distributed species, the Willow-Grouse (*Lycopus albus*)—an amount of individual variability capable of still further and perhaps indefinite modification as to colour, should occasion arise whereby such modification might be rendered necessary for the persistence of the stock.

new Species of Shells in the Collection mo Melvill. By G. B. Sowerby, Junr.

[Received December 30, 1881.]

(Plate V.)

RYTANIS. (Plate V. fig. 1.)

omewhat pyriform, lightish brown, here and there longi- y streaked with darker brown, encircled with a well-defined w pale band below the middle; spire short; whorls 9, smooth, upper ones sloping, the rest squarely turreted, with bold whitish bercles at the angles, banded with dark brown between the tubercles; last whorl slightly rounded at the upper angle between the tubercles, faintly ribbed towards the base. Aperture of moderate width, nearly equal at both ends, light purple within. Lip thin, with scarcely any sinus at the upper extremity. Length 35, width at the angle 20 millim.

Hab. Galapagos Islands.

In looking over Mr. Melvill's fine collection of Cones in October last, he called my attention to this shell, which he had obtained in 1873 at the sale of the late Thos. Norris's collection, and to which he had given in manuscript the above name, not having been able to identify it with any known species. I have since compared it with *C. lividus* (Brug.), which it resembles in colour, but from which it differs materially in form, being much shorter, with convex sides, slightly contracted at the base. It differs also from that species in the character of the crown, the tubercles being more clearly defined and elevated than in any specimen of *C. lividus* with which I have met. Its next ally is *C. brunneus* (Mawe), the whorls of the spire of which species are distinctly grooved, whereas in this they are smooth. It differs also from that species somewhat in form, and in the whitish band with which it is encircled. The shell it is most like in form and coronation is *C. tiaratus* (Brod.), which is a species far removed from it in colour and markings.

Upon searching the British-Museum collection, Mr. Edgar A. Smith drew my attention to three specimens similar in every respect to Mr. Melvill's shell, and undoubtedly of the same species, marked "Galapagos, sandy mud (H. Cuming)." They had been mistaken for a variety of *C. brunneus*.

CONUS EVELYNÆ, sp. nov. (Plate V. fig. 2.)

Shell elongately pyriform, pale yellow, striped with light brown, encircled with an interrupted whitish band; spire rather short; whorls flattened, with four spiral grooves, coronated with elongated flattened tubercles at the angle; apex prominent; last whorl very faintly striated, rather convex below the angle, and slightly attenuated towards the base. Aperture rather narrow, a little widened towards the base, interior white. Length 28, width at the angle 14 millim.

Although a shell of no very striking form, and having characters in common with several, there is no species to which I can very closely compare it. The spire is rather like that of *C. punctatus*, Hwass; but it is a much more slender shell, and the painting is quite of a different character.

CONUS SEMIVELATUS, sp. nov. (Plate V. fig. 3.)

Shell pyriform, plum-colour, white at the top; spire short; whorls slightly convex, smooth; last whorl rounded at the upper angle, then convex, and contracted at the base. Aperture moderate, purple within. Length 16, width 10 millim.

Hab. Red Sea.

A remarkable little species, of a very unusual colour. The whole of the spire and just the top of the last whorl is plain white, and the rest of the shell of a uniform plum-colour.

The specimen is in perfect condition; and its operculum, which is preserved, is very small and thin. Mr. Melvill gave the shell the above name in manuscript in his collection. I have seen two other specimens, varying very little from the type.

CONUS DIANTHUS, sp. nov. (Plate V. fig. 4.)

Shell rather abbreviately conical, pale pink, with irregular patches of orange; transversely rather distantly ribbed, longitudinally faintly striated, striæ undulating across the ribs and forming thereon minute scales; ribs closer, stronger, and smoother towards the base; spire rather short, regularly conical; whorls 10, flatly sloping, undulated at the angle, last two or three with a concave depression just above the angle; the last whorl has the upper angle obscurely coronated, sides nearly straight, or very slightly convex. Aperture rather narrow, a little wider towards the base, pink within. Lip very little sinuated at the upper extremity. Length 28, width at the angle 13 millim.

An interesting species of peculiar sculpture, the waved striæ crossing the ribs giving them more of a scaly than of a nodulous appearance.

CONUS WILMERI, sp. nov. (Plate V. fig. 5.)

Shell fusiform, pale brown, transversely ribbed, ribs strong, rounded, smooth, equal in width to the interstices, which are crossed with thread-like striæ; spire very elevated, whorls 11, flatly sloping, with three deep-cut spiral grooves, keeled at the angle, a spiral cord against the suture; last whorl with the upper angle acutely keeled, sides sloping, and attenuated towards the base. Aperture narrow. Lip slightly sinuated at the upper extremity. Length 21, width 8 millim.

Hab. Port Blair, Andaman Islands (*Lieut.-Col. Wilmer*).

Much narrower than *C. acutangulus* (Ch.), with a very elevated spire.

MITRA MELVILLI, sp. nov. (Plate V. fig. 7.)

Shell cylindrically fusiform, encircled throughout with deeply

6, sloping, scarcely convex; nucleus smooth; last whorl somewhat swollen, contracted towards the base. Aperture oblong, dark brown within. Lip with a moderate sinus above, denticulated within. Canal very short. Columella with a nodulous callosity above. Length 4, width 2 millim.

Hab. Florida, on *Ostrea virginica* (*Melvill*).

Mr. Melvill found specimens of this shell as noted above in 1872, and in 1879 gave the species the above name in manuscript in his collection; but the shell has not I believe been hitherto described. It is allied to *C. nigricans*, but smaller and quite different.

FISSURELLA MELVILLI, sp. nov. (Plate V. fig. 11.)

Shell oval, rather elevated, broad behind, slightly contracted in front; radiately closely ribbed, ribs very little raised, alternately larger; concentrically wrinkled; pale green, interior greyish white. Orifice round, subcentral. Margin slightly irregularly wrinkled. Length 50, width 40, height 22 millim.

Differing from its congeners chiefly in the rotundity of its orifice.

PECTEN SIBYLLÆ, sp. nov. (Plate V. fig. 12.)

Shell thin, suborbicular, acutely elevated at the umbones, equilateral, equivalve. Colour light orange, concentrically faintly banded with darker orange. Upper valve slightly convex, lower somewhat flatter; both valves very finely and closely ribbed, ribs very delicately serrated. Right auricle narrow, extending to about a quarter of the length of the shell from umbo to margin; left auricle moderately broad. Alt. 58, lat. 56 millim.

A very beautiful species with delicate sculpture; the ribs are very numerous and close-set, varying slightly and promiscuously in size, not regularly alternating as in some species. The delicate close-set scales cover the whole of the ribs.

The specimen passed from the collection of the late Thomas Lombe Taylor into that of Mr. Melvill, who gave it the above name in manuscript.

PECTEN LOXOIDES, sp. nov. (Plate V. fig. 13.)

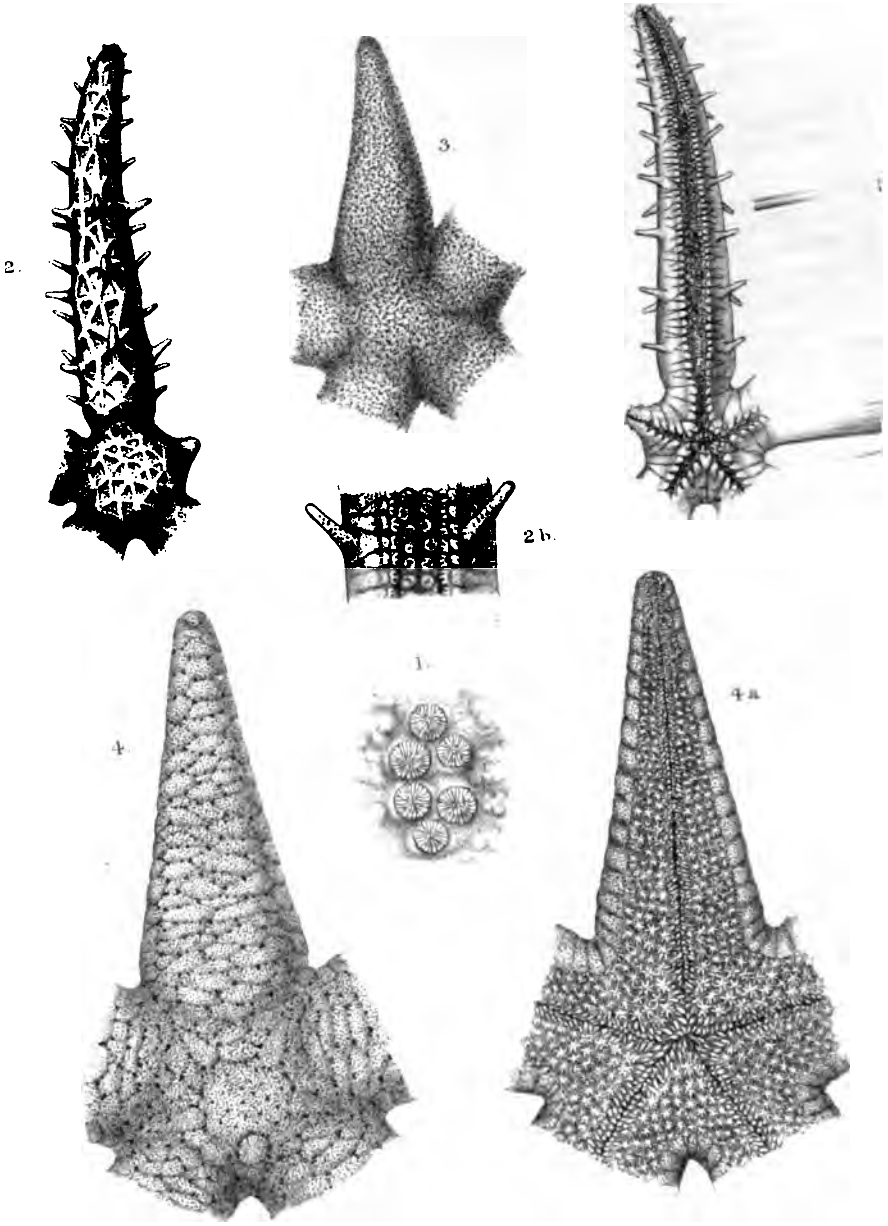
Shell rather thin, obliquely subovate, inequilateral, white, with the upper valve transversely undulately streaked, and spotted with pinkish orange. Lower valve rather deep, upper slightly convex. Radiating ribs 20 in number, prominent, rounded, smooth; interstices about equal in width to the ribs, also smooth. Auricles small, the right rather larger than the left. Alt. 25, lat. 24 millim.

Hab. Australia.

The valves of the specimen are odd; there are also odd valves of the same species in the British Museum. The species is quite unlike any hitherto described, and may be easily recognized by the obliquity of its outline.

CONUS TEXTILE, var. EUETRIOS. (Plate V. fig. 6.)

Compared with *C. canonicus* (Brug.), more pyriform and atten-



Mintern Bros. imp.

Berjeau del. et lith.

NEW ASTEROIDEA.

t the base; very closely and beautifully inlaid with minute white lar scale-like markings upon a dark-brown ground, disposed e broad bands; the colour in the narrow spaces between the is lighter brown, with the markings tending to zigzag streaks; arkings of the spire are waved streaks crossing the whorls. h 51, width 23 millim.

. Melvill had named tbis shell in manuscript *Conus euetrios*; admit that it is quite as worthy to be considered a species as *nonicus* (Brug.), *C. vicarius* (Lamk.), *C. verriculum* (Reeve), *rchiepiscopus* (Brug.), *C. tigrinus* (Sowerby), *C. corbula* and *stus* (Sowerby), all of which, however, I consider varieties of *us textile* (Linnæus). It is the opinion of some that, having got s far, other species, such as *C. abbas* (Brug.), *C. panniculus* L.), *C. legatus* (Lk.), &c., should be included; but having had eptional opportunities, from time to time, of examining large mbers of specimens of all the varieties, I continue to regard these st as species.

EXPLANATION OF PLATE V.

ig. 1. *Conus prytanis*, p. 117.
2. —— *evelynæ*, p. 117.
3. —— *semivelatus*, p. 118.
4. —— *dianthus*, p. 118.
5. —— *wilmeri*, p. 118.
6. —— *textile*, var. *euetrios*, p. 120.
7. *Mitra melvilli*, p. 118.
Fig. 8. *Pseudoliva* (*Macron*) *stereoglypta*, p. 119.
9. *Engina xantholeuca*, p. 119.
10. *Columbella* (*Anachis*) *ostreicola*, p. 119.
11. *Fissurella melvilli*, p. 120.
12. *Pecten sibyllæ*, p. 120.
13. —— *loxoides*, p. 120.

4. Descriptions of new or rare Species of Asteroidea in the Collection of the British Museum. By F. Jeffrey Bell, M.A., F.Z.S.

[Received January 10, 1882.]

(Plate VI.)

Although naturalists are agreed that it is most convenient to publish descriptions of new species in connexion with a systematic review of the groups to which they severally belong, I venture on this occasion to depart from the custom, as a knowledge of these new species may be agreeable to those who are interested in the order, while the revisions can only appear slowly, and at perhaps great intervals of time.

Calvasterias antipodum, n. sp. (Plate VI. fig. 1.)

The credit of recognizing the generic affinities of this species must be given to M. Perrier; for there is attached to the bottle containing it a label bearing, in his handwriting, "*Calvasterias*, sp." It formed part of the collection made during the voyage of the 'Erebus' and 'Terror.'

R = 61; r = 19. Arms five, greatest breadth of arm 17·5 millim. Adambulacral spines generally in a single row, stout and rounded at their tips. Madreporic plate almost subcentral. The integument is thick, and has a peculiar clamminess; and the spines developed on the surface are rather scale-like rounded processes, ornamented with a radial striation; of these an irregular series extends along the median dorsal line of each ray; towards the extremity of the ray the scales become a little thinner and longer, or, in other words, more spinous; the striation may still be detected on their tips. While at this end they are somewhat scattered, they are more numerous at the base of the arm, where also they are larger. Passing into the disk a complete circlet is made by these processes, the aggregation at the base of each radial series being brought into connexion with its fellows by interradial aggregations. In this way a rather broad though somewhat feebly indicated circlet of modified spines lies around the centre of the disk; a few similar spines are to be found in the central space. In the middle of one of the interradial aggregations there is placed the madreporic plate, which thus comes to be surrounded by a circlet of spines. On the arms three rows of pore-areas may be made out on either side of the median row of spines, which are the only spinous processes that are developed on the abactinal surface. The marginal spines, short and blunt and pretty regularly arranged, have an appearance not unlike that presented by the jaw of a *Cyclodus*. Between them and the adambulacral spines there is a bare space, which, in this spirit-specimen, is narrow and groove-like. The whole creature is of a yellowish-white hue; and the suckers are little darker than the rest of the body.

A single specimen. The only indication of its habitat is the fact that it was collected during the voyage of the 'Erebus' and 'Terror.'

5

CRIBRELLA MINUTA, n. sp. (Plate VI. fig. 2.)

R = 18; r = 6·5 Arms five, 6 millim. wide at their base, and somewhat rapidly diminishing in breadth. The abactinal surface plain, and similar for its whole extent. The adambulacral spines fringing the groove are arranged in a single row; there is generally one for each plate; they are of a fair size, and are distinctly separated from one another. Externally to these there is a series of transverse rows, containing at least three or four spines, and sometimes having them arranged in double order. Beyond these, and separated from them by a more or less distinct longitudinal groove, is a longitudinal row of closely packed spines. Externally to this there are a number of combs of spines set transversely, which occupy the edge of the actinal surface of the ray. The next series of spines is not so regularly arranged, and leads to the irregular disposition of spiniferous ossicles which obtains on the abactinal surface. The madreporic plate is small, obscure, and marginal. No pedicellariæ detected.

The colour of the single example (which has been in spirit for more than twenty-five years) is dead white.

Ecuador (Haslar collection, J. O. Goodridge, Esq., R.N.).

MITHRODIA VICTORIÆ, n. sp. (Plate VI. figs. 3, 3 *a*.)

R = 26·5, r = 3·5; R = 30, r = 4·6. Arms five, 4 or 4·2 millim. wide at their base, and not diminishing in breadth for some distance from the disk; integument of the abactinal surface marked out into spaces by the arms of the calcareous skeletal pieces; a few spines, two or three millimetres long, are to be found along the middle line of the arm; a few spines, which are generally a little longer, are placed at the upper or abactinal edge of the side of the arm. They frequently exhibit a white and brown patchwork-like coloration, which is due to the arrangement of the pigment in the integument which covers them. The actinal or lower margin of the side of the arm has along it from 7 to 10 spines of about the same length as those on the upper margin. The rather wide ambulacral groove is fringed by a regular series of short blunt spines, which are strongest in the region which falls within the disk. Within this series there is a row of smaller and more delicate spines, of which about five, set in fan-shape, belong to each ambulacral ossicle; the outer and larger spines may be coarsely granulated. The madreporic plate is small, white, and rounded, and is set not far from the centre of the disk; the abactinal surface of the disk presents no characters by which it may be distinguished from that of the arms; the papulæ on the actinal surface are rare. No pedicellariæ detected.

This new species is to be distinguished from *M. clavigera* by (1) the rarity of the papular spaces on the abactinal surface, (2) by the proportionally smaller spines, and (3) by the absence of a row of spines between the ventro-marginal series and the abactinal rows, a row which appears to be constantly present in the better-known form. Judging from the single specimen of *M. bradleyi* in the collection of the British Museum, that species has much larger papular pores, has two rows of spines on the actinal surface of the rays, and none at all on their abactinal surface.

Victoria Bank (20° 42′ S., 37° 27′ W.); depth 39 fathoms; bottom, dead coral.

Both the specimens from which the above description has been drawn up are injured; one appears to have lost one of its arms during life, as the free end is healed. They formed part of the collection made by Dr. Coppinger (H.M.S. 'Alert') in 1879-80; but they were not noticed in my report (P. Z. S. 1881), as they did not form a part of the fauna of the Straits of Magellan.

FROMIA INDICA.

Fromia indica, Perrier, Rév. des Stellér. p. 177.

Scytaster indicus, Perrier, Ann. Sc. Nat. (5) xii. p. 255.

Although M. Perrier's description states that his specimen has six rays, I have no hesitation in assigning to the species a five-rayed specimen, in which the proportion of R to r is somewhat greater than in the example which formed the object of M. Perrier's description. I base the determination chiefly on the following considerations:—The presence of six rays is of itself no evidence in favour of a true polyactinid condition as against a possible heteractinic peculiarity; and the decision can only be given with the aid of evidence which proves or disproves the idea that the species can and does undergo division. Such evidence is here afforded by the specimen in the national collection; for it has the arms of different lengths; this, of course, points to some of the arms being younger than the others, or, in other words, as having arisen by gemmation after division.

The heteractinic, rather than the sexradiate, condition should therefore be regarded as a part of the diagnosis of the species.

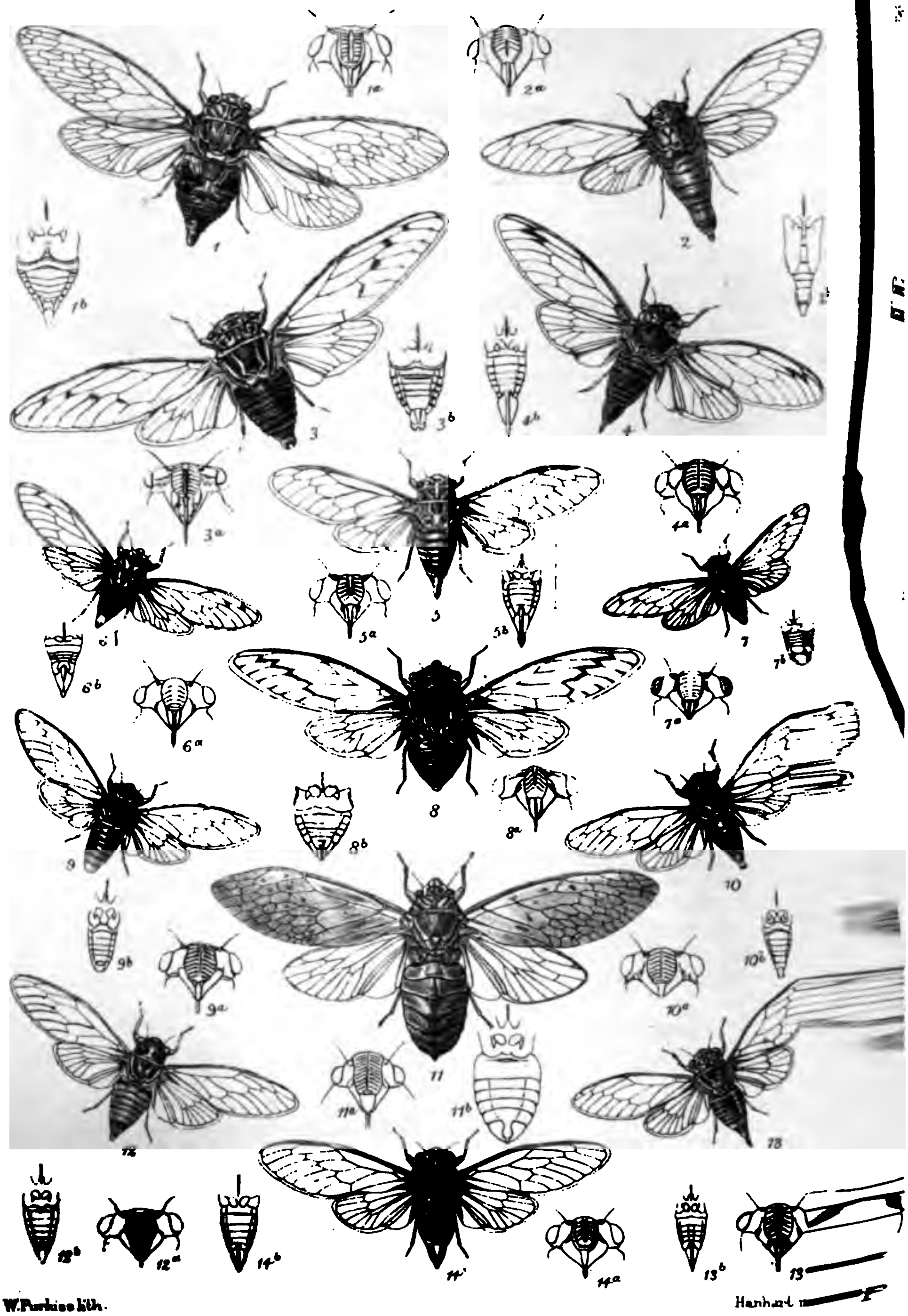
FROMIA TUMIDA, n. sp. (Plate VI. figs. 4, 4 *a*.)

Arms and disk more swollen than in most of the species of the genus. R = 45, r = 14; R = 35, r = 11·5, or R = 3·2 r (about); breadth of arms at base 14·5, 12·5 millim. All the plates on the actinal surface, with the exception of those of the marginal series, are closely covered with stout spines, from which the spines of the adambulacral series are distinguished by their smaller size. The whole of the abactinal surface is covered by squarish-headed granules, which are all of very much the same size, and are all very regularly distributed; they are arranged in elliptical aggregations, two or three rows of which extend along the back of the ray, or they are placed between these aggregations; in the former case they are somewhat more closely packed. The intermediate spaces, in addition to the granules, present a certain number of pores, which, however, are, in comparison with other species of this genus, rare. The madreporic plate is rather nearer the margin than the centre of the disk, and is very similar to the same body in *F. milleporella*. There are about seventeen marginal plates in both the actinal and abactinal series; and both sets are covered with granules of a fair size; and the marginal granules of each set are to be easily distinguished from the more central ones which they surround. For some way along the surface of the arm the dorso-marginal plates are deeper than long; the infero-marginal plates are much more nearly square. There seems to be a large pore at the proximal angle between the two sets of marginal plates; but as the two specimens on which this description is drawn up have both been dried, it is not possible to speak definitely on the point. The same remark will apply to the pore at the proximal angle of the actinal edge of the infero-marginal plates. The adambulacral spines appear to be arranged in three longitudinal rows. They are subequal in size, and diminish very slightly as they approach the free end of the ray. The space between these spines and the marginal plates is completely occupied with short [illegible] spines set in tufts on small plates. No pedicellariæ.

[illegible] Presented by M. Kelaart.

EXPLANATION OF PLATE VI.

[illegible] *[illegible]terias antipodum*, × 4 : 1.
[illegible] surface of *Cribrella minuta*, × 2 : 1.
[illegible] and abactinal surfaces of *Mithrodia victoriæ*, × 2 : 1.
[illegible] and abactinal surfaces of *Fromia tumida*, showing the [illegible] of the plates and spines, × 3 : 2.
[illegible] actinal surface, more highly magnified.



W. Purkiss lith.

Hanhart

ʼRALIAN AND PACIFIC CICADIDÆ.

5. On some undescribed Cicadidæ from the Australian and Pacific Regions. By W. L. Distant.

[Received January 13, 1882.]

(Plate VII.)

The species here described are almost wholly from the Museum Godeffroy at Hamburg, the Rhynchotal collection of which I have been requested to determine by Mr. Schmeltz.

Australia is particularly rich in Cicadidæ; and from what little is known at present it probably possesses the greatest number of that family compared with any other region of the globe. *Cyclochila, Psaltoda, Henicopsaltria, Thopha, Cystosoma,* and *Chlorocysta* are genera remarkable in structure, some extremely limited and none numerous in species and, so far as our present knowledge extends, completely confined to Australia; whilst the genus *Melampsalta,* though not altogether confined to that continent, is yet even now known to comprise a greater number of Australian species than can be found belonging to a genus in any other fauna. Two genera, *Cicada* and *Tibicen,* have almost a world-wide range, or are at least found in all the zoological regions.

If we compare the distribution of the Australian Cicadidæ with the geographical features of the botany of the same region, coincidences at once appear. Many affinities, as has been so ably pointed out by Dr. Hooker, exist between the South-African and Australian floras; and genera are found common to these two regions which are found nowhere else. One very striking and parallel case may be mentioned in the Cicadidæ. The Australian genus *Cystosoma* is strikingly dissimilar to the usual generic type in having a wonderfully inflated and dilated abdomen: in South Africa we find in this respect an analogous genus in *Pydna.* The extraordinary multiplicity of Australian species in the genus *Melampsalta* reflects the abundance of species in the genus *Acacia* as found in the same region.

In the specific nomenclature I have largely used the names of Australian explorers, qualitative terms being an impossibility to provide for these insects, and more likely to obscure than to elucidate their differences.

Cosmopsaltria stuarti, n. sp. (Plate VII. figs. 2, 2*a*, 2*b*.)

Body above pale greenish, sparingly pilose. Head with a spot on each lateral margin, and a smaller and rounded spot on each side of the ocelli, black; ocelli red margined with black; eyes dull ochraceous. Pronotum with two narrow, central, longitudinal fuscous fasciæ, somewhat faint and obliterated about centre, more widely divergent on anterior margin, and joined together on the posterior margin; oblique striæ behind eyes, and a spot on anterior inner border of lateral margin, also fuscous. Mesonotum with two central obconical spots margined with fuscous, a faint broken sublateral fascia on each side, an irregular spot on disk, and a small rounded spot in front of each anterior branch of basal cruciform elevation fuscous. Abdomen becoming faintly testaceous towards apex; body beneath and legs pale greenish; apices of the tibiæ, rostrum, tarsi, and apical segment of abdomen pale testaceous. Tegmina and wings pale hyaline; tegmina with the costal membrane pale greenish, the apical portion of the venation fuscous.

The abdomen is elongate, and much attenuated towards apex, the dorsal surface of the basal segment is somewhat rounded and produced anteriorly, and sinuated centrally on the posterior margin. The head, including outer margin of eyes (which are very large and prominent), is very little narrower than base of pronotum. The opercula reach the base of the third abdominal segment, and are broadly and deeply sinuate on their outer margin, with the apices rounded. Rostrum reaching posterior coxæ. Face with a central impression, and very strongly striated transversely.

Long. 21 millim.; exp. tegm. 51 millim.

Hab. Fiji Islands. (Mus. Godeffroy.)

This species is closely allied to *C. distans*, Walk., which is also found in the same locality. From this it differs in being only one half the size, and in having the dorsal surface of the basal segment of the abdomen sinuated behind, besides which the head is more produced in front and wider between the eyes relative to the width of the pronotum at the base. The opercula also are longer, as in Walker's species they do not reach the apex of the third abdominal segment.

TIBICEN BURKEI, n. sp. (Plate VII. figs. 3, *3a*, *3b*.)

♂. Head castaneous, area of the ocelli and two spots at base black, base ochraceous, more or less margined with black; pronotum ochraceous, with a central hourglass-shaped fuscous fascia, the centre of which is longitudinally ochraceous; on each side of disk is a small black curved fascia; oblique striæ, inner borders of lateral margins, lateral angles, and anterior border of posterior margin also blackish. Mesonotum black, with a small central angulated spot on disk, on each side of which is a waved and angulated fascia, narrowest and commencing on anterior margin and joined to anterior branches of basal cruciform elevation, followed by a straight sublateral fascia, ochraceous. Cruciform basal elevation dull ochraceous. Abdomen black, sparingly pilose; posterior margin of apical segment and anal appendage testaceous. Underside of head, sternum, and opercula ochraceous and pubescent, the last with the disk fuscous and posterior margin narrowly but clearly ochraceous. Face castaneous with the centre black. Anterior legs ochraceous, femora streaked with fuscous, base of tibiæ and apex of tarsi fuscous, apical half of tibiæ somewhat castaneous. Intermediate and posterior legs with the coxæ luteous; femora pitchy, with the apices luteous; intermediate tibiæ castaneous, with the base ochraceous, posterior tibiæ ochraceous. Abdomen beneath black, with the apical segment and anal appendage testaceous. Tegmina and wings pale hyaline; tegmina with the costal membrane and basal portion of venation ochraceous, costal area fuscous, anastomoses infuscated.

The rostrum just passes the apices of the posterior coxæ; face with the sides transversely striated, its width about equal to the distance from its lateral margin to inner margin of eyes; opercula not covering the apical margin of metasternum, with their posterior margins broadly rounded.

Long. 21 millim.; exp. tegm. 65 millim.

Hab. Australia, Peak Downs. (Mus. Godeffroy; coll. Dist.)

TIBICEN WILLSI, n. sp. (Plate VII. figs. 4, 4*a*, 4*b*.)

♀. Body above black. Head with the apex of face testaceous, the ocelli red. Pronotum with three large and confluent ochraceous spots on each side, somewhat narrowly separated at centre, and almost extending to lateral margins. Mesonotum black, with two very obscure obconical spots; basal cruciform elevation dull ochraceous. Abdomen black, with the apical segmental margins testaceous; anal appendage obscure pitchy-testaceous. Underside of body and legs pale testaceous; head between face and eyes black; lateral margins of sternum spotted with fuscous, and a lateral abdominal segmental row of transverse spots of the same colour. Tegmina and wings pale hyaline; tegmina with the venation fuscous, the costal membrane, basal and claval areas ochraceous, transverse veins at base of second and third apical areas, with connecting portion of longitudinal vein, infuscated; wings with the basal and claval areas ochraceous.

The face is very convex, narrowly and longitudinaly sulcated, the sides transversely striated, rostrum reaching the posterior coxæ; posterior lateral angles of pronotum somewhat acutely ampliated and produced.

Long. 20 millim.; exp. tegm. 53 millim.

Hab. Australia, Peak Downs, Sydney. (Mus. Godeffroy; coll. Dist.)

I have been enabled to examine nine specimens of this distinctly marked species, all of which, however, were females. In general appearance these have a superficial resemblance to the genus *Melampsalta*.

[Since writing the above I have discovered one male specimen of this species in the Godeffroy collection, which was received from Sydney. The opercula are pale ochraceous, with somewhat paler margin, and about reach the base of the first abdominal segment, they are slightly directed inwardly, the inner margins rounded and produced, but considerably apart, and the posterior margins wide and very slightly rounded.]

TIBICEN GILMOREI, n. sp. (Plate VII. figs. 8, 8*a*, 8*b*.)

♂. Body above dull testaceous. Head castaneous, the vertex somewhat darker than the front, area of the ocelli blackish. Pronotum with a central fuscous longitudinal fascia which has a very wide and triangular base, hind margin fuscous, with the posterior edge pale ochraceous. Mesonotum with two central obconical spots bordered with ochraceous, a curved fascia on each side of disk connected with anterior branches of cruciform elevation ochraceous, and a lateral black fascia bordered outwardly (anteriorly) and inwardly (posteriorly) with ochraceous: basal elevation ochraceous with a black spot at centre and one on each branch near apex. Abdomen sparingly pilose, with the posterior segmental margins ochraceous. Body beneath and legs ochraceous; face castaneous; disk of abdomen more or less castaneous, posterior segmental margins pale, anal appendage with a central longitudinal fuscous streak. Tegmina and wings pale hyaline: tegmina with the veins fuscous, anastomoses and connecting longitudinal veins (excepting that before the last and lower anastomosis) infuscated, apices of longitudinal veins narrowly infuscated.

The body is short, the front of the head produced and prominent, the face long and convex, rostrum reaching posterior coxæ; opercula small, not covering metasternum.

Long. 18 millim.; exp. tegm. 60 millim.

Hab. Australia, Swan River. (Coll. Dist.)

This species is allied to *T. interrupta*, Walk., but larger, body shorter and more robust, and head with the front much more produced.

TIBICEN MUELLERI, n. sp. (Plate VII. figs. 6, 6*a*, 6*b*.)

♀. Body above ochraceous. Head with two small spots at base of front, a spot near anterior lateral angle of vertex, and area of the ocelli fuscous: eyes tinged with fuscous. Pronotum with two central longitudinal black fasciæ sinuated at centre and meeting on anterior and posterior margins; a small oblique fascia commencing from behind eyes and terminating on lateral margins also fuscous. Mesonotum with two small obconical spots, inwardly margined with fuscous, and an elongate fuscous spot on disk in front of basal elevation. Scutellum with a central fuscous spot, which is continued and narrowed on the first three segments of the abdomen; anal appendage with a large fuscous spot on each side. Body beneath and legs pale ochraceous, abdominal segments with a transverse series of broad fuscous fasciæ. Tegmina and wings pale hyaline; tegmina with the costal membrane and basal half of venation ochraceous, transverse veins at bases of first and second ulnar areas, anastomoses with some of the connecting venation, apical longitudinal veins, apical margins of apical areas, and claval margin fuscous; transverse veins at bases of second and third apical areas broadly infuscated.

The head has the front prominently produced; and its width, including outer margin of eyes, is less than that of the base of the pronotum; the face is large, elongate, and very convex, with a faint longitudinal impression, and somewhat obscure transverse striations. The rostrum reaches the posterior coxæ.

Long. 11 millim.; exp. tegm. 38 millim.

Hab. Australia, Peak Downs. (Mus. Godeffroy.)

TIBICEN GREGORYI, n. sp. (Plate VII. figs. 7, 7*a*, 7*b*.)

♂. Body above pale ochraceous. Head with the ocelli reddish, the eyes tinged with fuscous, mesonotum with two very obscure central obconical spots, a central discal longitudinal and two sublateral fasciæ. Abdomen somewhat thickly covered with greyish pilosity. Body beneath and legs pale ochraceous, excepting the abdomen, which is pale fuscous. Tegmina and wings pale hyaline; tegmina with the venation ochraceous, excepting apical longitudinal veins and apical margins of apical areas, which are pale fuscous; transverse veins at bases of second and third apical areas broadly infuscated.

The head is broad, and, including eyes, as wide as pronotum, of which the anterior and posterior width is subequal. The face is large, elongate, and very convex, with faint transverse striations. The rostrum reaches the posterior coxæ. The opercula are small, broad, and rounded posteriorly, and about reach the posterior edge of metasternum.

Long. 10 millim.; exp. tegm. 34 millim.

Hab. Australia, Peak Downs. (Mus. Godeffroy.)

This species is allied to the preceding (*T. muelleri*, Dist.), from which it differs in the broader and less anteriorly produced head, the shape of the pronotum, and in the different markings of the abdomen, tegmina, &c.

MELAMPSALTA WARBURTONI, n. sp. (Plate VII. figs. 9, 9*a*, 9*b*.)

Head with the vertex black, the front ochraceous with a black central longitudinal line. Pronotum ochraceous, with a central longitudinal fascia, lateral and posterior margins dark castaneous. Mesonotum dark castaneous, with two pale irregular fasciæ on disk, commencing on anterior margin and terminating at anterior angles of basal cruciform elevation; anterior lateral margins narrowly ochraceous. Abdomen ochraceous. Body beneath and legs ochraceous; head black, with the face ochraceous, of which the transverse striæ are castaneous. Tegmina and wings pale hyaline, with the venation ochraceous.

The body is sparingly pilose above; the anterior femora are armed with three strong spines; the rostrum just passes the intermediate coxæ; the face is narrowly but deeply sulcated longitudinally, and strongly transversely striate.

Long. 15 millim.; exp. tegm. 38 millim.

Hab. Australia, Peak Downs. (Mus. Godeffroy; coll. Dist.)

MELAMPSALTA FORRESTI. (Plate VII. figs. 10, 10*a*, 10*b*.)

♂. Body above ochraceous. Head with a transverse black fascia between the eyes, partly surrounding ocelli. Pronotum with the frontal portion of the interior edge of lateral margins narrowly black, and the anterior edge of posterior margin broadly of the same colour; two small obscure fuscous spots on anterior margin. Mesonotum with the following fuscous markings:—two central obconical spots, and two of somewhat like shape near lateral margins, one commencing near outer edge of anterior margin; the other joins anterior angles of basal elevation; these angles are bordered outwardly by an angulated spot, and inwardly by a small rounded spot with a central longitudinal line. Abdomen with a series of pale fuscous transverse segmental fasciæ. Body beneath and legs pale ochraceous, inner margin of eyes black. Tegmina and wings pale hyaline, venation ochraceous, becoming darker towards apex.

The body above is sparingly pilose, the rostrum just passes the intermediate coxæ, with its apex black; the face is deeply longitudinally sulcated, and strongly transversely striate; anterior femora armed with three strong teeth.

Long. 15 millim.; exp. tegm. 41 millim.

Hab. Australia, Queensland, Gayndah. (Mus. Godeffroy; coll. Dist.)

The females of this species are somewhat larger than the males, but vary in size.

MELAMPSALTA EYREI, n. sp. (Plate VII. figs. 12, 12*a*, 12*b*.)

♂. Head black, with the anterior and lateral margins testaceous and with a small central basal ochraceous spot; ocelli reddish, eyes dull ochraceous. Pronotum ochraceous, with two very large rectangular black spots placed somewhat obliquely, commencing on inner edge of lateral margins, and divided on disk by a central longitudinal fascia which is widened anteriorly and posteriorly and is marked at base by a small black spot. Mesonotum with two central obconical spots placed close together, and two larger ones near lateral margins, black. Abdomen with the disk tinged with reddish, the posterior segmental margins bright ochraceous, the apical segment irregularly marked with black. Body beneath ochraceous; face black, with the anterior margin testaceous, the lateral margins ochraceous; inner margin of eyes to base of rostrum, a few scattered and irregular spots on sternum, apex of rostrum, and apical segments of abdomen black. Tegmina and wings pale hyaline; venation ochraceous, becoming darker towards apex.

The body is sparingly pilose, rostrum just passing the intermediate coxæ, anterior femora armed with three spines; face broad but compressed, broadly and longitudinally sulcated and distinctly transversely striate.

Long. 16 millim.; exp. tegm. 44 millim.

Hab. Australia, Peak Downs. (Mus. Godeffroy; coll. Dist.)

MELAMPSALTA MACKINLAYI, n. sp. (Plate VII. figs. 13, 13*a*, 13*b*.)

Closely allied to *M. varians*, Germ., but much smaller; head broader, including eyes equal in width to base of pronotum; rostrum just passing intermediate coxæ; opercula small and pale ochraceous; tegmina much shorter, with the costa more rounded.

Long. 13 millim.; exp. tegm. 38 millim.

Hab. Australia, Peak Downs.

This species has also considerable affinity to *M. themiscura*, Walk., in markings, but differs much in size.

Melampsalta oxleyi, n. sp.

♀. Body above ochraceous. Head with the frontal margin, lateral margins of vertex, inner margins of eyes, and area of the ocelli (the last extending to base of head, and connected with inner margins of eyes) very dark castaneous. Pronotum with a pale central longitudinal fascia, bordered with black on each side, widest anteriorly and narrowed posteriorly; lateral and posterior margins much paler, inner border of first, and outer third of inner border of the second, narrowly fuscous. Mesonotum with two short central obconical spots and two large sublateral and subtriangular spots dark fuscous, and a small rounded fuscous spot at each anterior angle of basal cruciform elevation. Abdomen with segmental bases very broadly fuscous, and with a large fuscous streak on each side of anal appendage. Body beneath pale ochraceous; face, rostrum, and two small spots at base of ovipositor more or less fuscous. Tegmina and wings pale hyaline; tegmina with the venation pale ochraceous, transverse veins at bases of second and third apical areas broadly and darkly infuscated; upper margin of first apical area, outer margin of first to seventh apical areas, gradually increasing in width, till the whole of the sixth and greater part of the fifth and seventh areas are occupied, and apical external margin dark fuscous.

The head is broad, and with outer margins of eyes about equals in width the base of pronotum; the face is moderately convex, with a deep longitudinal sulcation and strong transverse striations. Rostrum reaching the intermediate coxæ; and body sparingly pilose above and more densely so beneath.

Long. 18 millim.; exp. tegm. 48 millim.

Hab. Australia, Peak Downs. (Mus. Godeffroy.)

The tegminal markings render this species very distinct. I have seen but one specimen (here described), which is a female.

Melampsalta landsboroughi, n. sp. (Plate VII. figs. 14, 14*a*, 14*b*.)

♀. Head black, with a central longitudinal line to front and three basal spots ochraceous. Pronotum dull ochraceous, with a central pale fascia bordered with black, a short angulated fascia on disk and oblique striæ also black, lateral and posterior margins more or less shaded with black. Mesonotum black, very faintly and obscurely marked with ochraceous, the basal cruciform elevation pale ochraceous. Abdomen ochraceous with a broad central black fascia; the anal appendage with the lateral sides also broadly black. Body beneath, with the head, black, lateral margins of face ochraceous. Sternum much shaded with black. Legs ochraceous, coxæ and femora streaked with black and fuscous markings, anal appendage black, with a large spot on each lateral margin and extreme apex luteous. Tegmina and wings pale hyaline; tegmina with the costal membrane greenish-ochraceous, the veins fuscous.

The rostrum about reaches posterior coxæ; the face is broad, deeply and longitudinally sulcated, and transversely strongly striated;

the head, including eyes, is considerably narrower than base of pronotum; anterior femora armed with three strong spines.

Long. 16 millim.; exp. tegm. 45 millim.

Hab. Australia, Sydney. (Coll. Dist.)

This species was identified by Walker (List Hom. i. p. 172. 117, 1850) as the *Cicada melanopygia*, Germ., and thus stands in the collection of the British Museum. Germar's species, however, belongs to the genus *Tibicen*, and as such has been fully described by Stål (Ann. Soc. Ent. Fr. ser. 4, vol. 1, p. 618. 2, 1861.)

MELAMPSALTA LEICHARDTI, n. sp. (Plate VII. figs. 5, 5*a*, 5*b*.)

♀. Body above ochraceous. Head with the frontal anterior margin, a spot on anterior lateral angles of vertex, an oblique fascia behind eyes, two small linear spots between ocelli and eyes, a transverse spot on anterior margin of vertex, and antennæ black. Pronotum with two central linear black lines, not extending to posterior margin, and widened and angulated near anterior margin, oblique striæ, and inner border of posterior margin (on centre of which is a round spot) black. Mesonotum with two short contiguous central obconical spots, on each side of which is a more elongate and broken one, and two small rounded spots in front of basal cruciform elevation, black. Abdomen with a series of dorsal transverse black fasciæ, decreasing in width towards apex. Anal appendage with a black line on each side. Body beneath ochraceous; base and lateral margins of face, apex of rostrum, and ovipositor black. Legs ochraceous; femora streaked with fuscous; anterior tibiæ black, annulated with ochraceous near base. Tegmina and wings pale hyaline; tegmina with the costal membrane and area and veins enclosing basal ulnar area pale ochraceous, remaining venation fuscous.

Head, including eyes, equal in width to pronotum; rostrum reaching intermediate coxæ; face somewhat compressed, centrally and longitudinally broadly sulcated for half its length, and transversely striate.

Long. 10 millim.; exp. tegm. 25 millim.

Hab. Australia, Peak Downs.

This small but distinct species is allied to *M. sericevitta*, Walk.; and I am indebted to Mr. Pascoe for an opportunity of comparing the same. The figure here given is considerably enlarged.

CYSTOSOMA SCHMELTZI, n. sp. (Plate VII. figs. 11, 11*a*, 11*b*.)

Closely allied to the only other known species of the genus, *C. saundersii*, from which it differs in being only one third the size, and principally in the very different venation of the tegmina, the reticulations of which are faithfully portrayed in the figure, and cannot be adequately described, but are different in pattern and less extended in area than in the other species. The abdomen is much smaller and less inflated; the opercula are obscurely sinuated on their lateral and posterior margins.

Long. 25 millim.; exp. tegm. 62 millim.

Hab. Australia, Gayndah. .(Mus. Godeffroy.)

The tegmina of this species are bright green; but this is probably a variable character, as *C. saundersii* was originally described by Westwood as "pallide lutea," which perfectly agrees with the specimens in my own collection. Mr. Scott, however (Proc. Zool. Soc. 1852, p. 16), states that this is not correct, but that the species is "læte viridis." The fact evidently is that these two colours are common to the species, as is so frequently the case with others, and especially with Australian members of the family.

ARCYSTASIA, n. gen.

Head, including eyes, slightly narrower than pronotum. Antennæ with the first joints short but stout and prominent. Pronotum with the lateral margins slightly dilated and strongly depressed, the posterior angles strongly produced and rounded. Rostrum reaching the intermediate coxæ. Tegmina hyaline, much longer than abdomen; ulnar veins somewhat widely separated and divergent at base; apical half of venation reticulated. Wings with the veins of the apical half numerous and slightly reticulated. Abdomen robust; tympana detached. Opercula of male well developed, not quite reaching basal segment of abdomen. Anterior femora strongly spined. Metasternum with a central raised furrow.

Allied to *Cystosoma* by the reticulated venation of the tegmina, but differing in the hyaline condition of the same and the non-dilated abdomen. I have placed it next the genus *Acrilla*, Stål, which has the tegmina shorter, rostrum longer, and the lateral thoracic margins not dilated.

ARCYSTASIA GODEFFROYI, n. sp. (Plate VII. figs. 1, 1*a*, 1*b*.)

♂. Body above dull testaceous and olivaceous. Head with the vertex dull testaceous, with a central fuscous longitudinal impression at base, the front dark obscure olivaceous, area of the ocelli with some slightly pitchy markings. Pronotum dull testaceous with the lateral margins ochraceous, and a central fuscous longitudinal impression, of which the margins and raised base are pale testaceous. Mesonotum olivaceous, with two central obovate testaceous spots, on each side of which is a sublateral, slightly curved black fascia, the margins of which are testaceous; cruciform basal elevation pale testaceous, with a small rounded fuscous spot on inner side of apices of anterior branches. Scutellum pale olivaceous. Abdomen testaceous, the basal segment olivaceous. Body beneath pale testaceous; face, excluding margins, pale fuscous; sternum with olivaceous shadings. Legs olivaceous or testaceous; coxæ, trochanters, bases and apices of femora, and apices of tibiæ spotted with castaneous. Tegmina and wings pale hyaline; the tegmina tinted with pale ochraceous, with the venation darker ochraceous. Wings with the veins ohraceous.

The face is long and subdepressed, with a broad central sulcation and faint transverse impressions. The opercula are moderately large, but do not reach the base of the first abdominal segment, outer margins almost straight, posterior margins broad and slightly rounded, inner margins not meeting. Anterior femora armed with three strong spines beneath.

Long. 22 millim.; exp. tegm. 63 millim.

Hab. Ponape (Caroline archipelago). (Mus. Godeffroy; coll. Dist.)

EXPLANATION OF PLATE VII.

Fig. 1, 1*a*, 1*b*. *Arcystasia godeffroyi*, p. 133.
2, 2*a*, 2*b*. *Cosmopsaltria stuarti*, p. 125.
3, 3*a*, 3*b*. *Tibicen burkei*, p. 126.
4, 4*a*, 4*b*. —— *willsi*, p. 127.
5, 5*a*, 5*b*. *Melampsalta leichardti*, p. 132.
6, 6*a*, 6*b*. *Tibicen muelleri*, p. 128.
7, 7*a*, 7*b*. —— *gregoryi*, p. 129.
8, 8*a*, 8*b*. —— *gilmorei*, p. 127.
9, 9*a*, 9*b*. *Melampsalta warburtoni*, p. 129.
10, 10*a*, 10*b*. —— *forresti*, p. 129.
11, 11*a*, 11*b*. *Cystosoma schmeltzi*, p. 132.
12, 12*a*, 12*b*. *Melampsalta eyrei*, p. 130.
13, 13*a*, 13*b*. —— *mackinlayi*, p. 130.
14, 14*a*, 14*b*. —— *landsboroughi*, p. 131.

February 7, 1882.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

Mr. Henry Seebohm exhibited a series of intermediate forms between *Carduelis caniceps* and *C. major* (the eastern form of our common Goldfinch, *C. elegans*), obtained at Krasnoyarsk in Central Siberia. The series showed every intermediate form between one species and the other, the white on the outer webs of the innermost secondaries increasing in exact proportion as the black on the crown and nape diminished. The supposition was that the two forms interbreed in this district and produce fertile offspring.

Mr. Sclater exhibited on behalf of Mr. Peter Inchbald, F.Z.S., two curious Ducks which had been shot on some ornamental water near Darlington in the county of Durham. One of these appeared to be the result of a cross between the Pochard (*Fuligula ferina*) and one of the freshwater Ducks, possibly the Teal or Mallard; the other presented nearly the appearance of a female Scoter (*Œdemia nigra*), but was rather darker below.

The following papers were read:—

to the subursine section. It is true that the teeth have some resemblance to those of *Viverræ*; but this only results from the greater or less development of different cusps, being an adaptation to a more carnivorous diet."

He observes, as to *Proteles*[1], that it "has the cranial characters common to the Cats and Hyænas: from the dentition, so singularly modified by arrest of development, but little evidence of zoological affinity can be adduced; I should therefore be rather inclined to consider it a modified Hyæna, since in the external characters it so closely resembles the animals of that genus." As to the Hyænas themselves, he declares himself disposed to consider them, judging from their cranial characters, as rather more approaching the Cats than the *Viverræ*, but proposes to obviate the difficulties thus arising by a division of his family *Felidæ* into three subfamilies, one for the Cats, another for the *Viverræ*, and the third for the Hyænas and *Proteles*.

The characters and subdivisions of his family *Felidæ* are expressed as follows[2]:—

Fam. FELIDÆ.

Auditory bulla rounded, frequently showing indications of being divided into two parts.

Paroccipital process flattened, and applied to the back part of the auditory bulla.

Foramen condyloideum more or less concealed. Foramen glenoideum very small or wanting.

Cæcum small or moderate, simple. Cowper's glands present. Prostate gland salient.

Subfam. VIVERRINA (confined to the Old World).

A distinct alisphenoid canal (with very few exceptions).
Auditory bulla distinctly subdivided.
Canalis caroticus distinct, though sometimes only as a groove.
True molars on each side $\frac{2}{2}$.

Galictis.	*Cynogale.*
Ryzæna.	*Paradoxurus.*
Cynictis.	———
Herpestes.	*Prionodon.*
———	*Genetta.*
Arctictis.	*Viverra.*

Subfam. HYÆNINA (confined to the Old World).

No alisphenoid canal.
Division of auditory bulla scarcely perceptible.
Canalis caroticus indistinct, or very small.
True molars on each side $\frac{1 \text{ or } 0}{1}$; premolars on each side $\frac{4}{3}$.

Proteles.	*Hyæna.*

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[1] *Loc. cit.* p. 82.

[2] *Loc. cit.* p. 86.

Subfam. FELINA (of general geographical distribution).

No alisphenoid canal.
Division of auditory bulla slightly or scarcely perceptible.
Canalis caroticus indistinct or not perceptible.
True molars on each side $\frac{1}{1}$; premolars on each side $\frac{3}{\ }$.

Felis.

The genus *Arctictis* is placed in the above list amongst the *Viverrina* without any observations in the text. It should be noted that this subfamily is divided, by horizontal lines, into three sections, the two genera *Genetta* and *Viverra* standing nearest to the Hyænas, and *Herpestes* and *Ryzæna* remote from them.

Certain genera are not enumerated; and on this subject Mr. Turner tells us[1], "The lists of genera include only those whose crania I have examined; and therefore I must not be considered as rejecting any that I have omitted, nor do I pledge myself to adopt all that are inserted."

The third paper on the classification of the Carnivora is that of our president, Professor Flower[2]. Therein he refers to the paper by Mr. Turner, which he supplements by a number of new and original observations and inferences of great value, intentionally confining his remarks, however, to existing terrestrial (fissipedal) genera. He conclusively establishes the true Procyonine nature of *Bassaris* and the Paradoxurine affinity of *Arctictis*; while as to *Cryptoprocta*, he regards it as the type of a distinct family[3], though he considers it "as a perfectly annectent form, as nearly allied to the *Viverridæ* on the one hand as to the *Felidæ* on the other." *Proteles* he also constitutes the type of a distinct family, which he interposes between the Suricates and the Hyænas, as he interposes *Cryptoprocta* between the Civets and Genets on the one hand and the Cats on the other. He fully adopts Mr. Turner's threefold division of the fissipedal Carnivora, but raises each of Mr. Turner's families to the rank of a suborder. Professor Flower's ARCTOIDEA and CYNOIDEA correspond respectively to Mr. Turner's *Ursidæ* and *Canidæ*, while Mr. Turner's *Felidæ* is divided by Professor Flower into the five families *Felidæ*, *Cryptoproctidæ*, *Viverridæ*, *Protelidæ*, and *Hyænidæ*—these five families being united into one suborder, for which he first instituted the term ÆLUROIDEA, the affinities of which are suggested by his diagram[4] (fig. 1).

The following characters common to the ÆLUROIDEA may be gathered from this paper:—

1. Bulla greatly dilated, rounded, smooth, thin-walled, with one exception osseous, and almost always divided by a septum into two distinct portions.

2. Bony meatus short or with its inferior wall imperfectly ossified.

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[1] *Loc. cit.* p. 85.

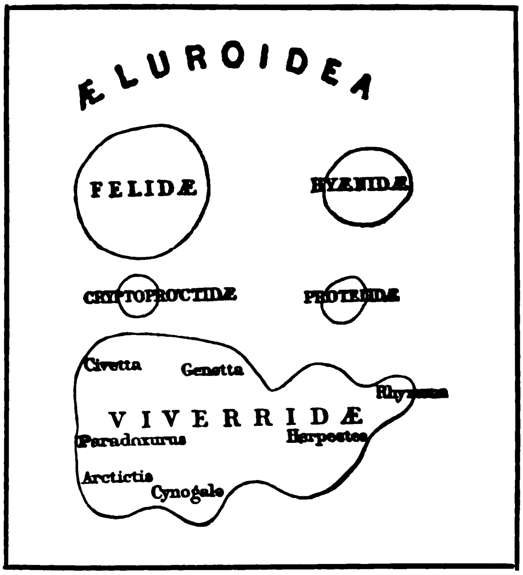
[2] "On the Value of the Characters of the Base of the Cranium in the Classification of the Order Carnivora, and on the Systematic Position of *Bassaris* and other disputed forms," P. Z. S. 1869, p. 4.

[3] *Loc. cit* p. 23.

[4] *Loc. cit.* p. 37.

3. Paroccipital process applied to and, as it were, spread over the hinder part of the bulla.
4. Mastoid process never very salient, often obsolete.
5. Carotid canal small, sometimes very inconspicuous.
6. Condyloid fissure concealed.
7. Glenoid fissure extremely minute or absent.
8. Cæcum short and simple, very rarely absent.
9. Bone of penis generally small and irregularly shaped.
10. Cowper's gland present.
11. A distinctly lobed prostate.

Fig. 1.



In the above diagram the Herpestine genera are represented as somewhat separated by a constriction from the Civets and Paradoxures. In the text the author tells us[1] "all the Herpestine members of the *Viverridæ* (*Cynopoda*, Gray) present certain common characters of this region by which they can be readily recognized. The bulla is very prominent and somewhat pear-shaped, the larger, rounded end being turned backwards and somewhat outwards; a well-marked transverse constriction separates the two chambers, which are directly anterior and posterior. . . . The Suricate presents the same essential characters in a very modified form."

As to the Hyænas, Professor Flower appears to hesitate somewhat as to whether they should form "a fourth primary division of the Carnivora, or be added, as rather aberrant members, to the Æluroid section. On the whole," he adds, "I am inclined to the latter arrangement," especially from the support given to it by the genus *Proteles.* As to the characters of that genus, he observes[1] :—" In the first place they are thoroughly Æluroid, but they do not exactly the agree with either of the families of that group as hitherto defined. On the whole they approach nearest to the Herpestine section of the *Viverridæ*, but deviate from this, and approximate to the *Hyænidæ*, in two points. . . . If Cuvier had called *Proteles* a Hyænoid Ichneumon instead of a Hyænoid Genette, exception could scarcely have been taken to the description."

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[1] *Loc. cit.* p. 20.

The object of the present paper is to carry further the examination of the affinities and interrelationships of the genera constituting Professor Flower's Æluroidea, and especially to discover what divisions below the rank of families can be most conveniently and naturally established in it. In order to effect this, I have, to the best of my ability, studied the animals living in our gardens, preparations preserved in the Museum of the Royal College of Surgeons, and the skins, spirit-specimens, and osteological treasures of the British Museum, and I have dissected such individuals as good fortune has thrown in my way. I have especially wished to note the cranial characters of such genera as are not referred to in the three papers already noticed, namely the genera *Fossa, Prionodon, Poiana, Hemigalea, Arctogale, Galidia, Galidictis, Bdeogale, Helogale, Cynictis, Rhinogale, Crossarchus,* and *Eupleres.* I have endeavoured also to ascertain and enumerate such papers and illustrations as may be most useful for reference or may have some historical interest.

It will, I think, be most convenient if I state at once the conclusions I have arrived at as to classification, and afterwards notice, seriatim, the several genera, giving separately the characters and references which refer to each.

In the first place I am profoundly convinced that the great group ÆLUROIDEA is a natural one, and that the Hyænas must, without any question whatever, be included within it. The only doubt is as to their claim to rank as a distinct family, so closely connected do they seem to me to be with the Herpestine group of *Viverridæ*. Anyhow I am unable to divide the suborder into so many primary groups as those of Professor Flower.

I have examined with as much care as I could the skeleton of *Cryptoprocta*, and considered the evidence recorded as to its soft parts, and have come to the conclusion that it is distinctly Viverrine, and not at all unquestionably intermediate, as I at first supposed, between *Viverra* and *Felis.* Its dentition is of course almost feline; but the more I study comparative anatomy, the more impressed I am with the little value of dental characters as evidences of affinity, save as regards allied species or genera. *Nandinia, Arctictis,* and *Cynogale* may be cited as evidence of divergences in dental characters from the more normal Viverrine type, to which other structural divergences do not run parallel. Professor Flower himself has remarked[1]:—"Too exclusive attention has been paid to the characters of the teeth in defining the family divisions of the order. The difficulty in the taxonomic use of these organs arises from the fact that the teeth of all the members of such a limited and well-defined group as the terrestrial or fissipedal Carnivora are formed on the same general type, but with infinite modifications of this type. And as these modifications are mainly adaptive, and not essentially indicative of affinity, they reappear in various degrees and combinations in many of the great natural divisions of the order. Their teeth alone afford us no satisfactory means of diagnosis between the very distinct groups of the *Procyonidæ* and *Viverridæ*. The teeth of *Proteles*, though demonstrating undeniably its right to a place in the order, are so rudimentary or generalized that they afford no help whatever to determine its special position. Again, the teeth of *Gulo* are so similar to those of *Hyæna*, that, if this character alone were used, these two otherwise widely differentiated forms would be placed in the closest proximity. *Enhydris*, among the Mustelidæ, and *Cynogale*, among the Viverridæ, might also be cited as examples of strangely modified dentition, with comparatively little corresponding change in other parts." I thoroughly agree with every word here cited; and, until unexpected evidence as to the anatomy of its soft parts comes to my knowledge, I must rank *Cryptoprocta* as merely the type of a subfamily of the *Viverridæ*.

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[1] *Loc. cit.* p. 29.

As to *Proteles*, the words just quoted from Professor Flower concerning it confirm the previously cited remark of Mr. Turner[2], that from a "dentition so singularly modified by arrest of development, but little evidence of zoological affinity can be adduced." It differs from the Hyænas in having a developed pollex; but such differences occur in the Herpestine section of the *Viverridæ*, yet no one on that account would erect *Bdeogale* and *Suricata* into a distinct family, any more than *Ateles* or *Colobus* amongst the *Anthropoidea*. A careful consideration of the characters of *Proteles* have convinced me that it should be included within one family along with the Hyænas; and Professor Flower, in his paper on the anatomy of *Proteles*, concludes[3] by saying that, though still "inclined" to retain it in a distinct family, yet his examination of its soft parts shows its affinities with the Hyænas "are closer than the examination of the skull alone led" him "to suppose." I would, however, while merging it in the Hyæna family, yet retain it as the type of a distinct subfamily of the *Hyænidæ*.

If my views are correct, then the suborder Æluroidea will consist of three families—(1) the *Felidæ*, (2) the *Viverridæ*, and (3) the *Hyænidæ*.

As to the first of these families, it is evidently impossible to group any of its existing forms in distinct subfamilies. Indeed, in a recent careful study of the *Felidæ*, I have been quite unable to find satisfactory characters whereby to divide that family into more than the two genera *Felis* and *Cynælurus*.

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[1] P. Z. S. 1869, p. 5. [2] P. Z. S. 1848, p. 82. [3] P. Z. S. 1869, p. 406.

It has been proposed to separate off as a distinct genus the Cats with a vertical pupil and an orbit inclosed behind by bone, and to divide the round-pupilled Cats into two genera, according to the presence or absence of a first upper premolar.

These characters do not appear to me capable of serving as marks of generic distinctness. Some Cats—as *F. macrocelis*, *F. serval*, and *F. chaus*—are described as having a pupil neither round nor linear when contracted, but oblong; and while in most of the smaller Cats in which the point has been ascertained the pupil is linear, in some, as *F. eyra*, it is round. The length of the postorbital processes varies even in the same species, and much more in forms which must be connected as close allies; while the morphologically second upper premolar may also be present or absent in the same species, as in *F. scripta*, *F. pajeros*, and others, while in *F. planiceps* it is large and two-rooted. In the skull of an old Lion[1] I have found the upper two molars not only absent, but every trace of their alveoli also. The ears of the Lynxes are pencilled, but those of *F. chaus*, *F. ornata*, and *F. caudata* are more or less pencilled likewise. The Lion stands alone with its large mane (though the Ounce has a small one), and the Tiger is distinguished from every other Cat by its stripes; but these no one would take to be generic distinctions.

We might indeed separate off the Lion, Puma, Jaguar, Eyra, *F. aurata*, *F. planiceps*, *F. badia*, and *F. rutila* as Cats of a uniform colour, neither spotted nor striped when adult. The group, however, would not be a natural one. Similarly, we might associate together the most distinctly spotted Cats, while distinguishing others (as *F. marmorata*, *F. macrocelis*, *F. megalotis*, *F. pajeros*, *F. caligata*, *F. manul*, *F. neglecta*, *F. torquata*, and *F. catus*) as rather "clouded" than "spotted." Almost every transition, however, exists between the spotted and clouded Cats, and some spotted forms occasionally have their spots very slightly marked; so that generic distinctions reposing on any such characters would be most futile.

It is not the object of this paper to define species; nevertheless the question as to the distinctness of certain of them will have to be occasionally considered. I may therefore perhaps be excused for remarking that I have examined a large quantity of skins of the Lynxes known as *F. borealis*, *F. canadensis*, *F. rufa*, and *F. maculata*, and found amongst them so very many intermediate conditions as to both coloration (ground-colour and markings) and length of fur, that I cannot but regard them as forming but a single species. This opinion is also confirmed by the close resemblance which exists between their skulls.

As to the Lynx *F. isabellina*, I was at first inclined to regard it as a good species; but Dr. Scully has very kindly allowed me to examine the skins obtained by him in Central Asia, and amongst them is one intermediate in coloration between the *F. isabellina* of the British Museum and certain specimens of the Northern Lynx. The Pardine Lynx (*F. pardina*) I am disposed to regard as a distinct species on account of the form of its skull. When the skull is seen in profile, it differs from the skulls of the varieties *F. borealis*, *F. canadensis*, *F. rufa*, and *F. maculata* in that the part between the orbits is more raised and convex, and the nasal bones extend backwards beyond the nasal processes of the maxillæ.

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[1] No. 4504 A in the museum of the Royal College of Surgeons.

Considering the length of time during which we have had power in India, it is remarkable that our collection of Indian Cats should be so imperfect as it is. I am, however, not without the hope of being hereafter able to exhibit here a new collection of the skins and crania of these animals. The species known as *F. bengalensis* especially requires investigation, as, if its range of variation both in size and markings is not very extensive, several distinct species must be included under that name.

Amongst African Cats that described by Lesson[1] under the name *F. senegalensis* was probably but a young Serval. There is unfortunately no specimen of it in the Paris Museum; and the type was a cat living at the hospital of Rochefort-sur-Mer. We have as yet, so far as I know, no specimen of *F. colocollo* in this country; and we much need more skins and skulls from America to help us to determine the value of the forms distinguished as *F. tigrina*, *F. mitis*, and *F. macroura*.

The second Æluroid family, the *Viverridæ*, presents a great contrast to the first in the great variety of the forms it contains. Instead of being unable to divide it into subfamilies, the difficulty is to avoid making too many. Two subfamilies, *Viverrinæ* and *Herpestinæ*, must, I think, be instituted for the Viverrine and Herpestine sections of the group. In the former must stand *Viverra*, *Viverricula*, *Fossa*, *Genetta*, *Prionodon*, *Poiana*, *Paradoxurus*, *Arctogale*, and *Hemigalea*. In the latter I would place *Herpestes*, *Helogale*, *Cynictis*, *Bdeogale*, *Rhinogale*, *Crossarchus*, and *Suricata*.

As to *Nandinia*, *Arctictis*, and *Cynogale*, arguments are by no means wanting in favour of the erection of each of these three genera into a distinct subfamily. I hesitate, however, so far to multiply groups of that rank; and I would retain them all, at least provisionally, amongst the *Viverrinæ*.

The genera of this subfamily seem to group themselves in two sets (as was indicated by Mr. Turner[2]), one set being that of the Civets, the other that of the Paradoxures, as follows:—

A. *Viverra*, *Viverricula*, *Fossa*, *Genetta*, *Prionodon*, and *Poiana*.

B. *Paradoxurus*, *Arctogale*, *Arctictis*, *Hemigalea*, *Nandinia*, and *Cynogale*.

The subfamily *Herpestinæ* seems divisible into two sets—one (A) including *Herpestes*, *Helogale*, and *Cynictis*; while the second set (B) will comprise *Crossarchus* and *Suricata*. I cannot certainly determine to which set *Bdeogale* and *Rhinogale* should belong till more of their anatomy is known.

It is to the latter set that I regard the *Hyænidæ* as specially allied, while *Cryptoprocta* (in spite of its claws and dentition) seems

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[1] Guérin's Mag. de Zool. 1839, t. x. (Mammifères).

[2] P. Z. S. 1848, p. 87.

The distinctive characters of the *Felidæ* are :—

(1) There is a short pollex with a claw not, or hardly, reaching to distal end of metacarpal of index.
(2) The hallux is only represented by a rudimentary metatarsal bone.
(3) The ungual phalanges are greatly arched, with a wide lamina to shelter the base of the claw.
(4) The claws are greatly arched, sharply pointed, and, except in *Cynælurus*, completely retractile.
(5) The auditory bulla is much inflated, smooth, and rounded, but hardly shows any external sign of division into two chambers.
(6) The bulla is more prominent towards its inner than towards its hinder border.
(7) There is an almost complete bony septum between the two chambers of the bulla, which are one behind the other.
(8) The bony meatus auditorius is short and neither produced anteriorly nor inferiorly; neither is it imperfectly ossified below.
(9) There is no carotid foramen anywhere visible on the surface of the basis cranii.
(10) There is no alisphenoid canal.
(11) The palatine foramina are situated in the hinder half of the palate.
(12) $\frac{\text{P. 1}}{}$ and $\frac{}{\text{P. 2}}$ are not developed[1].
(13) There is no lower tubercular molar, no $\frac{}{\text{M. 2}}$, and no $\frac{\text{M. 2}}{}$.
(14) $\frac{\text{M. 1}}{}$ is always very small and transversely extended.
(15) The antero-external cusp of $\frac{\text{P. 4}}{}$ is fairly developed, but is much smaller than the two others.
(16) $\frac{}{\text{M. 1}}$ has hardly any talon.
(17) The outer incisors but little exceed the middle ones in size.
(18) Humerus with a supracondyloid foramen.
(19) Bone of penis small.
(20) The ears not very long, erect and pointed.
(21) Tarsus and metatarsus hairy.
(22) One small plantar pad, and one beneath each digit.
(23) The anus does not open into a saccular depression.
(24) Two anal glands only.
(25) No prescrotal glands.
(26) Always a more or less small cæcum.
(27) Many very hard, horny, sharp-pointed, conical papillæ on the dorsum of the tongue.
(28) Hippocampal gyrus not[2] completely separated from the antero-

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[1] The mandible of a Tiger with $\frac{}{\text{P. 2}}$, killed in British Burmah, is described and figured by B. A. Lydekker in the Journ. Asiat. Soc. Beng. vol. xlvii. (1878). p. 2, plate ii.

[2] So far as I have had an opportunity of examining.

with (for the period) a very full account of the structure of the animal. The Civet and Zibet are well figured and described by Daubenton in Buffon's 'Histoire Naturelle,' vol. ix. pp. 299–342, pls. 31 to 35. Anatomical notes on these animals are also given by John Hunter, pp. 51–55 of vol. ii. of his 'Essays and Observations,' collected and published by Professor Owen in 1861. A few notes "On the Internal Viscera of *Viverra melanurus*" have also been published by Hodgson in the 'Calcutta Journal of Natural History,' vol. ii. (1842) p. 56. Recently an account of the anatomy of the Civet, with one plate, has been published by Dr. J. Chatin in the Ann. des Sc. Naturelles, (5th series) vol. xvii. (1873), plate xxiii., wherein the heart and great vessels, the stomach and liver, and the cæcum are represented. Lastly, we have in vol. xix. (1874) of the same work a paper by the same author on the "glandes odorantes des Mammifères," wherein the scent and anal glands of the Civet and Zibet are described and figured (pls. i. and ii. figs. 1–13), and notes are added concerning *Viverra tangalunga*. The external form of the Civet and of the Zibet are given in F. Cuvier's Mamm. vol. ii. The skeleton of the Civet is represented on plate iv. of De Blainville's 'Ostéographie' (*Viverra*), and the skull and dentition of the Civet and Zibet on his plates viii. and xii.; details of the axial and visceral skeleton on plate ix.; and the distal part of the Zibet's humerus on pl. x.

All the four species of *Viverra* agree in having a more or less white throat with transverse, curved, black bands; all have the tarsus and metatarsus hairy beneath, as in the *Felidæ*; all have the back with more or less elongate hair: and all are of large size, the head and body being from about 76" to 92", and the tail from about 31" to 43". *V. tangalunga* is the smallest species, and has been confounded with *V. megaspila*; but the distinctions between the two species have been pointed out by Dr. Günther in the Proc. Zool. Soc. 1876 (pp. 427, 428), wherein is a good representation of *V. megaspila* in both the adult and young condition. The young in this genus seem to be always darker than the adults. The young Civet (judging from a skin in the British Museum) is almost black, with a black tail (whitish beneath its root), and with a greyish mottling on the flanks and outside the thighs, greyish belly, and with white marks on the cheeks, upper lip, inside of ears, underside of throat, and side of the neck[1]. I have not seen the skull of *V. megaspila*: but, assuming that it closely resembles those of the other species, it may be said that in *Viverra* the auditory bulla is divided by a distinct groove into a small anterior part and a much larger and more inflated posterior portion. There is an internal septum (as in *Felis*). There is a distinct alisphenoid canal. The paroccipital process depends below the bulla, to which it is applied. The external opening of the auditory meatus is large and rounded; it is rather its hinder than its anterior margin which projects most outwards. The carotid artery passes through a distinct canal between the bulla and basisphenoid, the hinder end of which appears as a conspicuous foramen situated a little in front of the middle of the inner border of the auditory bulla.

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[1] Hodgson, in the 'Calcutta Journal of Nat. Hist.' vol. ii. (1842) p. 55, says that the eyes of the young are open when less than a week old; also that the adults wander about singly and eat small mammals, birds, reptiles, and insects, and some roots.

The orbit is never enclosed by bone; nor is the mastoid at all prominent. The lower margin of the hinder part of the mandible is very concave. The angle of the mandible is long, slender, and backwardly projecting; its coronoid process is not very high or backwardly projecting compared with that of *Felis*. There is a $\frac{}{\text{P. 2}}$ and an $\frac{}{\text{M. 2}}$. There is also a $\frac{\text{P. 1}}{}$ and an $\frac{\text{M. 2}}{}$. $\frac{}{\text{M. 1}}$ is of large size. $\frac{\text{P. 4}}{}$ has a well-developed internal tubercle. The tongue is devoid of horny papillæ or of any patch of conspicuously enlarged papillæ on the anterior part of its dorsum. There is a small conical cæcum. There is a pair of anal glands. There is also a pair of medianly-adjoining scent-glands placed between the penis and testes, or in the analogous position in the female. Their secretion escapes by a number of minute orifices into a large sac, the external aperture of which appears as an antero-posteriorly extended slit simulating a large vaginal aperture.

The genus *Viverra* differs from all the *Felidæ* in that

(1) The ungual phalanges are less arched, and the bony lamina for sheltering the base of the claw is relatively less deep.
(2) The claws are less arched and less perfectly retractile.
(3) The auditory bulla, being ossified, shows external signs of its complete internal division into two chambers.
(4) There is a conspicuous carotid foramen on the inner side of the bulla, which is most prominent posteriorly.
(5) The palatine foramina are situated on the anterior half of the palate.
(6) There is a $\frac{}{\text{P. 2}}$ and also an $\frac{}{\text{M. 2}}$.
(7) $^{\text{M.1}}$ is largely developed.
(8) $\frac{}{\text{M. 1}}$ has a distinct talon.
(9) The ears are not very long, erect, pointed, or tufted.
(10) There are no horny, sharp-pointed, conical papillæ on the dorsum of the tongue.
(11) The hippocampal gyrus is completely separated off from the lateral gyrus by the continuation of the calloso-marginal sulcus forwards to the crucial sulcus.
(12) The coronoid process of the mandible is less lofty relatively and less backwardly produced.
(13) The proportional length of the limbs to the body is shorter than even in *Felis eyra*.
(14) The muzzle is longer in proportion to the cranium.

The genus *Viverra* also differs from the *Felidæ* in that

(15) There is a distinct hallux with a claw.
(16) There is an alisphenoid canal.

(17) There is a $\frac{\text{P. 1}}{}$.
(18) There are prescrotal scent-glands.

The genus agrees with the *Felidæ* in that

(19) There is a short pollex.
(20) The ungual phalanges are arched to a certain con extent.
(21) The claws are arched, sharp-pointed, and somewhat
(22) The bony auditory meatus is not produced anterio feriorly, neither is it imperfectly ossified below.
(23) The humerus has a supracondyloid foramen.
(24) The tarsus and metatarsus are entirely hairy.
(25) There is one plantar pad and another beneath each d
(26) The anus does not open into a saccular depression.
(27) There are two anal glands only.
(28) There is a small cæcum.

As further characters may be noted that

(29) Rather the posterior than the anterior margin of th auditory meatus projects the more.
(30) The orbits are not enclosed by bone.
(31) There is no conspicuous foramen on the basis cranii the carotid perforating or notching the sphenoid shal the cranium.
(32) The hinder chamber of the bulla is not everted so external as well as posterior to its anterior chamber.
(33) The palate is not much produced beyond the hinder
(34) The mandibular angle is not everted.
(35) The mastoid is not prominent.
(36) The paroccipital process depends below the bulla, t is applied.
(37) The opening of the auditory meatus is rather larg triangular.
(38) The bulla is narrower in front than behind.
(39) It is not much laterally compressed.
(40) The skull is not greatly constricted behind the p processes of the frontal.
(41) The pollex and hallux reach to the end of the adja hand bones.
(42) The scent-glands open into a deep prescrotal pouch
(43) The median part of the back is marked with black.
(44) The nose exhibits a median antero-posterior groo under surface and on the upper lip.
(45) There is an $\frac{\text{M. 2}}{}$.
(46) $\frac{}{\text{M. 2}}$ is not minute.
(47) The dentition is markedly sectorial.
(48) Hinder part of palate not inclined strongly upwards.
(49) Hinder part of alveolar border of mandible not evert
(50) Teeth not very small.
(51) No notch in alveolar border of maxilla to receive ap

(52) There is no plate-like process on the outer side of the radius.

(53) There is no oval patch of conspicuously-enlarged papillæ on the dorsum of the anterior part of the tongue.

(54) Ascending ramus of mandible not flattened beneath.

(55) Tail long.

(56) Anterior premolars not greatly elongated.

The next genus comprises only the Rasse, for which the genus *Viverricula* has been instituted[1] by Hodgson, who says that it differs from species of the genus *Viverra*, which never climb, by its scansorial habit. It is also distinguishable from *Viverra* by its smaller size, smaller snout, and by a very small bald spot on the tibial side of the plantar pad, noticed by Gray[2] and figured by Hodgson[3]. The alisphenoid canal is almost always absent; the bulla is, as Professor Flower says[4], "large, as wide in front as behind, much elongated, narrow, and compressed laterally. The anterior chamber is rather more developed, and less distinctly marked from the posterior." The postorbital processes are longer than in *Viverra*; and the skull is greatly compressed behind them. The paroccipital process does not depend below the bulla. The pollex and hallux are shorter, not reaching to the distal end of the adjoining metatarsal and metacarpal. The character of the dentition is intermediate between that of *Viverra* and that of *Genetta*. $\overline{M\,2}$ may have only three cusps. The Rasse has a most extensive geographical distribution, having been obtained in China, Foochow, Formosa, Amoy, Gangootra, Camboja, Singapore, Nepal, Madras, Ceylon, Penang, Java, Lombok, Bombay, Socotra, Madagascar, and also from the Comoro Island Anjuan[5].

The Rasse has been described at length, and many interesting details concerning it given, by Horsfield in his 'Zoological Researches in Java' (1824), with a figure of its external form, representations of which will be found in F. Cuvier's 'Mammifères,' vol. ii.; also in Sonnerat's 'Voyage,' vol. ii. p. 144, pl. 91; and in Pollen's 'Faune de Madagascar,' p. 16, pl. 10. Its dentition, both immature and adult, is given on plate xii. of De Blainville's 'Ostéographie' (*Viverra*). Its foot-pads are represented by Hodgson, Calcutta Journal of Natural Hist. (1842), vol. ii. pl. 1. fig. iv. As might be expected from its wide distribution, the Rasse varies greatly in colour and markings, similarly coloured varieties coming from widely separated localities. There is in the

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[1] Journal of Asiat. Soc. of Bengal (1841), vol. x. part 2, p. 909. See also Gray, P. Z. S. 1864, p. 513, and Brit. Mus. Cat. of Carnivora (1869), p. 47.

[2] Brit. Mus. Cat. p. 47.

[3] Calcutta Journal of Nat. Hist. (1842), vol ii. pl. 1. fig. iv.

[4] P. Z. S. 1869, p. 18.

[5] The animal from this island has been described and figured by Dr. Peters in his 'Mossambique.' Dr. Gray threw out the suggestion that this individual might be of the genus *Fossa*; but Dr. Peters has been kind enough to inform me that such is not the case, but that it is identical with Pollen's *Viverra schlegeli*, which appears to me to be a variety of the widely diffused *Viverricula malaccensis*. Dr. Peters remarks to me:—"If not identical with, it is very near that species."

British Museum a light-yellow skin from Candy, and one from Nepal, which is but little darker. Generally the ground-colour is greyish, brownish, or yellowish, and there is a tendency to the development of black bands on the middle of the back and loins, black spots on the flanks, and rings on the tail. The young are very dark, but not so much so as are the young Civets, and they also want the white markings of the latter. The scent-gland is formed as in *Viverra*. Length of head and body about 61″, of tail about 38″.

The genus *Viverricula* agrees, then, with the genus *Viverra* in all the characters before enumerated, except numbers 16, 24, 36, 38, 39, 40, and 41.

The genus *Fossa* is represented in the national collection by four skins, two skulls, and a skeleton. The genus was instituted by Dr. Gray[1] on the strength of Daubenton's description; and though it seems nearly allied to the Rasse, its generic distinctness should, I think, be maintained, at least till its anatomy is more fully known, especially that of its glandular structures. I could not find evidence of a scent-pouch in the British-Museum skins. Neither could Daubenton in his specimen; and M. Poivre (who sent Buffon the stuffed skin described in his work) wrote on the subject as follows:— "La Fossane que j'ai apportée de Madagascar, est un animal qui a les mœurs de notre fouine; les habitans de l'île m'ont assuré que la fossane mâle étant en chaleur, ses parties avoient une forte odeur de musc. Lorsque j'ai fait empaillé celle qui est au Jardin du Roi, je l'examinai attentivement, je n'y découvris aucune poche, et je ne lui trouvai aucune odeur de parfum." Not improbably there are some subcutaneous scent-glands, but no pouch or even deep cutaneous fold in connexion with them.

The limbs are slender; and there are the very small bald places (to which Mr. Oldfield Thomas was kind enough to call my attention) beneath the hind foot. One of these is a little above the plantar pad, very near the small hallux (the claw of which may be wanting in the adult), and the other beneath the distal part of the tarsus, slightly nearer to the peroneal margin of the limb. Another noteworthy character is the absence of any median dark mark on the back. The adult may be very little striped or spotted, with only some spots on the flanks and some obscure stripes on the shoulders; but the young is very distinctly striped; yet even in the young there is no median dorsal stripe, but the central portion of the back is of the general ground-colour, bounded by two rows of small irregular spots, external to which are three strongly marked longitudinal stripes on each side. The black throat-bands (which exist in *Viverra*) are entirely absent. The tail is spotted, the spots tending to form, but not actually forming, rings.

The length of the head and body is about 43″·2, that of the tail 20″·3.

The Fossa is only known as an inhabitant of Madagascar. Its external form is figured, and the animal is described, in Buffon, vol.

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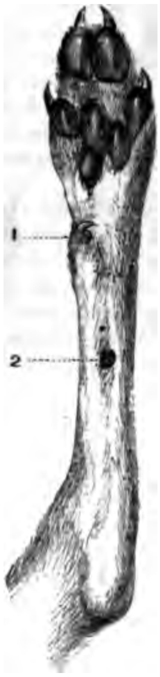
[1] P. Z. S. 1864, p. 518.

xiii. p. 163, pl. 21. It is also described and well-figured by Dr. Gray, in Proc. Zool. Soc. 1872, p. 869, pl. 74, with a woodcut of the skull, which is long and narrow, approaching *Viverricula* in this respect.

The bulla is shaped much as in *Viverra*; there is a distinct alisphenoid canal; the paroccipital process depends a little below the bulla. There is, on the skull, a deep antero-posteriorly directed groove along the middle of the dorsum of the forehead and muzzle. The postorbital processes are not so elongated as in *Viverricula*. The teeth closely resemble those of *Viverra*; but the talon of $\overline{\text{M. 1}}$ is rather smaller; $\overline{\text{M. 2}}$ has five cusps, three in front and two behind. *Fossa* therefore agrees with *Viverra* in all the characters of the latter genus before enumerated, except sometimes No. 15, possibly No. 18, and certainly Nos. 24, 38, 39, 40, 42, & 43.

Fig. 2.



Plantar surface of left pes of *Fossa*.
1. Small pad adjacent to hallux; 2. Ditto beneath distal part of tarsus.

The genus *Genetta* consists apparently of five species, distributed as follows:—G. vulgaris (from the south of France, Spain, North Africa, and Western Asia to Mount Carmel), G. *felina* (from South Africa, including the Cape), G. *senegalensis* (from Africa, East, West, and North), G. *tigrina* (from South Africa, Abyssinia, and [illegible]), and G. *pardina* (from West Africa and Fernando Po).

Thus the genus is essentially African, sending one species on to

Fig. 8.

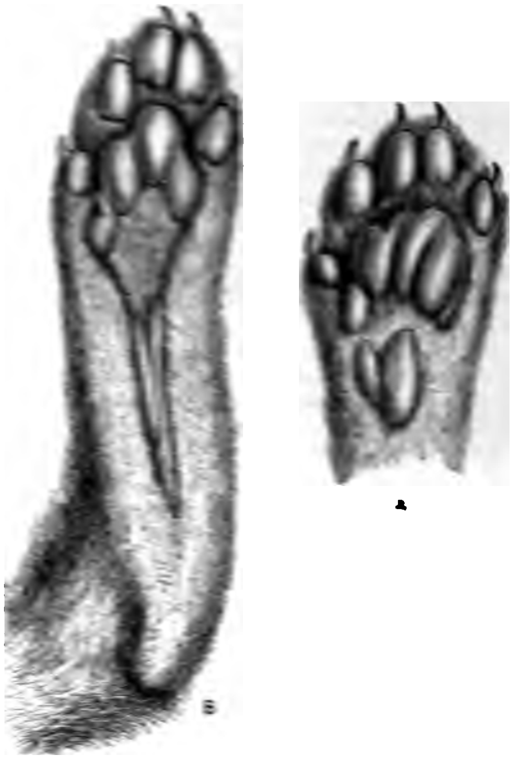


Fig. [illegible]

A. [illegible] B. [illegible]

Europe and Western Asia; while Viverra is mainly Asiatic, but has one species exclusively African. In Viverricula and Genetta *vulgaris* we have the only species common to Asia and Africa.

The two groups the Civets and Genets certainly merit to rank as distinct genera; for, in addition to uniformly smaller size and the distinction of geographical range of the latter, they have certain distinctive cranial, dental, and external characters. Thus, instead of the tarsus and metatarsus being hairy as in *Viverra* and *Viverricula*, or with the small bald spots as in *Fossa*, there is a long, narrow bald strip of skin running up beneath the median part of the metatarsus, towards or to the tarsus. This bald strip, however, is separated from the plantar pad by an intervening hairy portion; and the toes are hairy beneath at the sides. A hairy patch in the manus also separates the proximal part of the palmar pad from its distal portion. All the Genets are of a brownish-yellowish or greyish tint, with black or brown spots on the flanks, and a black line in the middle of the back (thus differing from *Fossa*). There are brown or black stripes behind the ears, extending downwards and backwards over the shoulders. The paws are blackish or whitish; the belly is light-coloured with a few spots; and there is a lightish patch over the eye, and a white spot beneath the eye, separated by a black mark from another white spot beside the nose. The tail is ringed with black.

The characters of skull and teeth by which the Genets differ from the Civets and the relations of this kind presented by *Viverricula* and *Fossa* are as follows:—

The auditory bulla in *Genetta* is not so triangular in form as in *Viverra*, but more equal in width anteriorly and posteriorly, as we have seen to be the case in *Viverricula* (where it is also more laterally compressed); but in *Genetta* the anterior part is more swollen and bullate. The alisphenoid canal is constantly present in *Genetta*, but is small in calibre. In both *Genetta* and *Viverricula* the auditory opening is relatively larger than in *Civetta*. The paroccipital process, which descends down below the bulla, is a depending process in *Viverra*[1], and slightly so in *Genetta*, but does not so extend at all in *Viverricula*. In the last named the skull is extremely compressed behind the postorbital processes, its breadth there being to the total cranial length as but 11·5 to 100, instead of 14·1 as in the Civet, 14·4 as in *Fossa*, and 18·7 as in *Genetta*.

In all the four genera *Viverra*, *Viverricula*, *Fossa*, and *Genetta* the alisphenoid canal is generally (even in *Viverricula* when it *is* present) long, its hinder opening being often in close proxmity to the foramen ovale, the opening of that foramen and the hinder aperture of the alisphenoid canal appearing respectively at the hinder and anterior ends of a common depression in the cranial surface.

The teeth of *Genetta*[2] differ from those of *Viverra* in that $\frac{\text{M. 2}}{}$

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[1] Very slightly so in *V. tangalunga*.

[2] As *Genetta* appears to be (at least after *Prionodon*) the genus of existing *Viverridæ* which comes nearest to the *Felidæ*, it may not be useless to denote precisely the differences between the permanent and milk dentitions of the Genet and the Cat.

In the Genet the outermost upper incisors are larger in proportion to the innermost (length as 3 to 2). Each outermost lower incisor has a bilobed crown with nearly equal lobes. The canines are relatively shorter, not longitudinally furrowed. The upper canine compared with the base (*i. e.* with the interval between the basion and ovalion) taken at 100, is 46·1 in the Cat, 42·8 in the Genet. By "ovalion" I mean the centre of a horizontal line connecting the hindmost points of the margins of the oval foramina.

is (in general, but not in *V. tangalunga*) relatively largeı
obtusely triangular oı even nearly quadrangular, and is ı
equal in size with the tooth in front of it; $\frac{\text{M. 1}}{}$ has a relat

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The following teeth, which are absent in the Cat, are present in
$\frac{\text{P. 1}}{\text{P. 1, P. 2}}, \frac{\text{M. 2}}{\text{M. 2}}$. $\frac{\text{P. 1}}{\text{P. 1}}$ are one-rooted. The second upper premolar, $\frac{\text{P.}}{}$
one-rooted in the Cat, is two-rooted, as is also $\frac{}{\text{P. 2}}$. $\frac{\text{P. 3}}{}$ has its
triangular than the Cat's, the heel (or talon) being smaller. $\frac{}{\text{P. 3}}$ i
that of the Cat. The upper sectorial $\frac{\text{P. 4}}{}$ differs from the Cat
anterior outer cusp is smaller, its third outer cusp, or talon, disti
and its inner cusp larger and more produced from the gener
the tooth. The homologous lower tooth, $\frac{}{\text{P. 4}}$, is very like that
The first upper molar $\frac{\text{M. 1}}{}$ is very much larger than that of the Ca
posterior extent compared with that of $\frac{\text{P. 4}}{}$ taken at 100, is in the
in the Cat, at most, only 30·0; its transverse diameter compared
$\frac{\text{P. 4}}{}$ taken at 100 is in the Genet 140·0, in the Cat only 80·0.
has three roots instead of only two as in the Cat. Its function
trihedral and presents two outer and one inner cusp, with an extern
which is very prominent at the outer anterior angle of the tootl
this and the two outer cusps is a flattened somewhat elevated (the
the basis cranii upwards) surface. $\frac{\text{M. 2}}{}$ is shaped like $\frac{\text{M. 1}}{}$, but i
smaller. The lower sectorial tooth, $\frac{}{\text{M. 2}}$ (the analogue, but not th
of the upper sectorial), has a much larger heel than has that of the
which is divided into an inner and an outer cusp. There is als
internal cusp, which is placed opposite to the principal external c
a much smaller tooth than $\frac{}{\text{M. 1}}$, and is generally quadrate or qua
but may be trihedral, with two cusps in front and one behind.

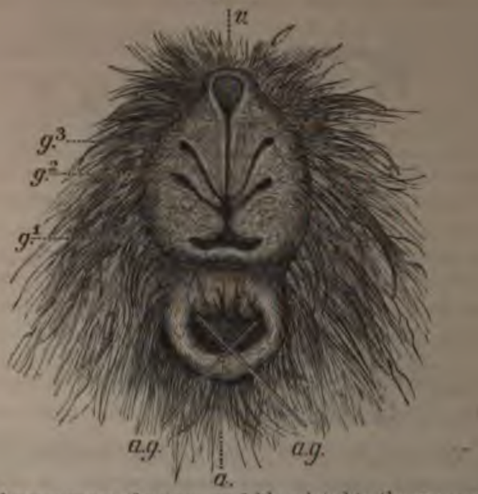
Of the milk-dentition I have not seen the first upper and low
molars. The second upper deciduous molar, $\frac{\text{D. 2}}{}$, has a rather mo
prominence, both in front and behind the main cusp, than has the
replaces it. It is therefore very unlike that of the Cat, which is a
one-fanged tooth. The second lower grinder $\frac{}{\text{D. 2}}$ is like $\frac{}{\text{P. 3}}$; but
larger and is distinctly divided. This tooth is not developed
The deciduous upper sectorial, $\frac{\text{D. 3}}{}$, agrees with that of the Cat i
unlike the tooth which replaces it, and in resembling $\frac{\text{P. 4}}{}$. It diff
permanent sectorial (as is the case in the Cat) in that the inne
latively smaller and nearer to the antero-posterior middle of tl
slight ridge extends from this inner cusp to the anterior cusp;
ridge a very small fourth cusp is developed. The homologous
$\frac{}{\text{D. 3}}$ is like $\frac{}{\text{P. 4}}$, but has a relatively larger talon, thus resembling tl
The hindmost upper milk-molar $\frac{\text{D. 4}}{}$ is quite like $\frac{\text{M. 1}}{}$, though n
antero-posteriorly extended as is the deciduous upper sectorial; it
Cat) larger in relation to it than is $\frac{\text{P. 4}}{}$ to $\frac{\text{M. 1}}{}$. The inferio
sectorial $\frac{}{\text{D. 4}}$ is quite like $\frac{}{\text{M. 1}}$, except that the antero-exterior cı
smaller than that immediately behind it. In this difference it agı
Cat's $\frac{\text{D. 4}}{}$, but it has not that excess of talon compared with $\frac{\text{M. 1}}{}$ wh

the accessory tubercle on that ridge larger; $\frac{\text{D. 4}}{}$ is the largest deciduous tooth, and nearly as extended antero-posteriorly as is that $\frac{\text{D. 3}}{}$; finally, $\frac{}{\text{D. 4}}$ has a larger talon, which by itself constitutes nearly half the tooth.

The external form of the Genet is figured by Buffon, and three kinds ("de Barbarie," "de Sénégal," and "panthérine") by F. Cuvier in his 'Planches des Mamm.' De Blainville (Ostéographie,' *Viverra*) gives the skull (plate viii.), details of the axial skeleton (plate ix.), and of the appendicular sketeton (plates x. and xi.).

A very important difference between *Genetta* and *Viverra* consists in the absence in the former of the pouch or sac for storing the secretion of the scent-gland. Instead of this I found, in a female *Genetta tigrina*, only a shallow cutaneous fold or longitudinal median depression. This groove or fold extended from the small orifice of the vagina towards, but not nearly to, the anus. From this median superficial depression two longitudinal grooves extended forwards and outwards on either side, whereof the two posterior were the larger. Beneath these grooves were two scent-glands, the product of which could be forced (by squeezing) through a multitude of minute pores into the depressed parts of the folds—the hinder rather than the anterior of the two pairs of diverging ones. Similar glands and folds were found by M. Chatin in the male of *Genetta*

Fig. 5.



External appearance of cutaneous folds related to the prescrotal scent-glands of the female of *Genetta tigrina*.

a. Anus. *a.g*. Needles inserted into the aperture of the two anal glands. g^1, g^2, g^3. Folds of scent-gland. *v*. Vagina.

senegalensis, and have been described and figured by him in the Ann. des. Sc. Naturelles, 5^e sér. vol. xix. (1874) pl. iii. fig. 14. These glands were described and figured by Daubenton in Buffon's Hist. Nat. vol. ix. p. 343, pls. 36–40. Therein the Genet dissected (a female) is described as having a distinct orifice at the bottom of each lateral depression, leading thence into the interior of the gland; but such is certainly not the case in my *G. tigrina*, any more than in Chatin's *G. senegalensis*, in both of which the secretion had only a multitude of minute pores through which to exude.

The genus *Genetta* agrees with *Viverra* in all the characters of the latter before enumerated, except Nos. 24, 38, and 42; and there are, besides, the differences in size and markings and in the more inflated condition of the anterior part of the bulla.

The beautiful Viverrine animals known as the Linsangs differ from the foregoing forms sufficiently to warrant their separation as members of the genus *Prionodon*, which may be said to have been first instituted by Horsfield, since in his 'Zoological Researches' (1824) he proposed for it the term *Prionodontidæ* to denote a subdivision of the genus *Felis*. He there describes it under the name of *Felis gracilis*[1], and gives a representation of its external form, and also separate figures of its head, dentition, and paw. Hodgson, in the 2nd part of the 2nd volume (1842) of the 'Calcutta Journal of Natural History,' p. 57, plate 1, describes a so-called second species of the genus *Prionodon* (*P. pardicolor*); and a third species, *P. maculosus*, has been described by Mr. Blanford in the 2nd part of the 47th vol. of the Journal of the Asiatic Society of Bengal (1878), p. 152, pl. 6 (external form) and pl. 7 (skull), the skin and skull of which are deposited in the British Museum, and some points in the anatomy of which I have examined.

In *Prionodon* the ground-colour of the coat is white or whitish grey, with brown or black markings. The markings may form four broad continuous patches running transversely across the hinder part of the body; or spots may replace each continuous patch. The tail is ringed; and there are dark streaks on the neck and shoulders. *P. gracilis* is from Borneo, Java, and Singapore; *P. pardicolor* from Nepal; and *P. maculosus* from Darjeeling, Moulmain, and South Tenasserim. As to size, the length of the head and body seems to average about 46″, and that of the tail 40″·5. The fur is soft, close, and erect. The limbs are rather short. The pollex and hallux are both well developed. The claws are almost, if not quite, as completely retractile as in the Cats. The tarsus and metatarsus are entirely hairy. Thus in this respect, as also in the character of the claws and the absence of $\frac{\text{M. 2}}{}$, *Prionodon* approaches *Felis* most closely, as Horsfield was careful to point out. The palmar and plantar pads have a greater tendency to break up into separate naked spaces than in *Genetta*; but, as in that genus, a hairy portion intervenes between the proximal and distal parts of the palmar pad. The pupil is circular.

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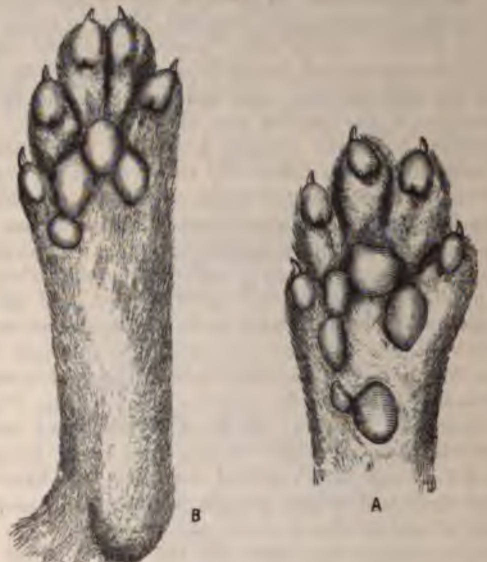
[1] *Prionodon gracilis*, Gray, P. Z. S. 1864, p. 519.

As to any scent- or prescrotal gland, Mr. Hodgson says[1]:—"Anal gland very apparently present, but the exact character of it not determinable." Horsfield records[2] of *Viverra*, "Folliculos glandulosos inter genitalia et anum;" but of *Prionodon* he says, "Folliculos supra anum nullos," but with a note of interrogation. The specimen examined by me was a male. Not only was there no opening in it between the penis and testes, but no glandular structure in that situation beneath the skin could be detected, either by me or by Mr. William Pearson, who assisted me in the dissection. There were the usual anal glands and a pair of exceedingly large Cowper's glands, each of them about equalling in size the whole of the bilobed prostate.

Fig. 6.



Pads of *Prionodon*.

A. Pads of left manus. B. Pads of left pes.

The skull has its general shape and proportions and the form of the auditory bulla much as in *Genetta*. The condyloid foramen is exposed. The paroccipital is neither depending nor prominent, and the mastoid no more prominent than in the Genets. There is a long alisphenoid canal, which opens behind in a depression common to it and to the foramen ovale. The postorbital processes are less marked than in any hitherto; and the skull is antero-posteriorly marked by a groove along the middle of the nasals, as in *Fossa*. The cerebellar chamber of the cranium is very large, larger relatively than in *Viverra* or *Civetta*. The cranial ridges are slight, the temporal ridges not uniting to form a sagittal ridge. The ascending ramus of the mandible has a narrower and more vertically prolonged coronoid process than in *Genetta*, while the angle extends less backwardly. The teeth[1] are formed like those of the Genets, save that there is no $\frac{\text{M. 2}}{\ }$ and that $\frac{\text{P. 4}}{\ }$ has rather a larger talon relatively, while its inner cusp is situated a little more towards the anterior end of the tooth. $\frac{\ }{\text{M. 1}}$ has also a smaller talon than has the corresponding tooth of *Genetta*; and $\frac{\ }{\text{M. 2}}$ is much more minute than is the $\frac{\ }{\text{M. 2}}$ of the Genets, and more laterally compressed, with two (or three) cusps placed one in front of the other. The deciduous teeth are like those of the Genets, save that $\frac{\text{D. 3}}{\ }$ seems to have its talon hardly smaller than in the adult, and has no extra cusp on the ridge joining the inner and anterior cusps. $\frac{\ }{\text{D. 3}}$ is unlike that of *Genetta* and is quite like $\frac{\ }{\text{M. 1}}$, except that the postero-external cusp is rather larger compared with the anterior one, and that the talon is a trifle smaller relatively.

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[1] Calcutta Journal of Nat. Hist. vol. ii. part 2 (1842), p. 51.

[2] 'Zoological Researches.'

Prionodon has all the characters enumerated as those of *Viverra*, except Nos. 1. 2, 12, 18, 42, 45, and 46.

The genus *Poiana* was founded by Dr. Gray on the *Genetta poensis* described by Mr. Waterhouse[2].

Its coloration is very like that of *Prionodon*; but the spots are smaller and show no tendency to run into transverse bands or stripes, except on the middle of the back of the head, and except a broad mark on each side descending from the back of the head to above the shoulder. The tail is ringed with dark rings, alternately broad and narrow. The muzzle is very pointed. The length of the head and body is about 38 inches, that of the tail 40·5 inches.

The animal comes from Sierra Leone and Fernando Po, and differs from *Prionodon* not only remarkably as to geographical distribution, but also in that it has a narrow bald line running up towards the tarsus, as in *Genetta*. I have been able to find no cranial distinctions between *Poiana* and *Prionodon*, save that in the latter the cerebellar chamber of the cranium is smaller, and that the coronoid process of the mandible is intermediate in form between that of *Genetta* and that of *Poiana*.

The teeth are also quite like those of *Prionodon*, except that $\frac{\ }{\text{M. 2}}$ is rather less laterally compressed, its three cusps being not placed so nearly in an antero-posterior line.

Thus this animal might be considered an African *Prionodon* which had acquired a Genet-like tarsus; and this determination

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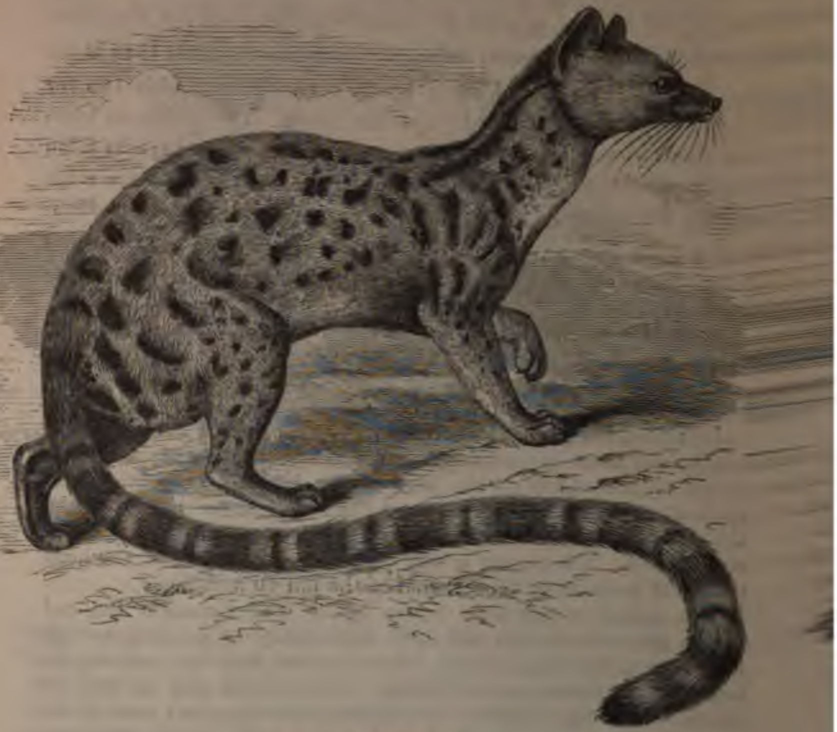
[1] The dentition (copied from Horsfield's plate) is given by De Blainville, Ostéographie, Viverras, pl. 12.

[2] P. Z. S. 1838, p. 59. See also P. Z. S. 1864, p. 520, and Brit. Mus. Cat. p. 54, fig. 8 (skull).

could be the less objected to, since I have found in *Prionod*
pardicolor a tendency to a narrow prolongation upwards of t
plantar pad, which I have not found in *Prionodon gracilis*. I ho
them therefore distinct quite provisionally and doubtfully. As th
species seems never to have been represented, I have thought well to figure it now.

Fig. 7.



External form of *Poiana*.

The genera yet noticed (*Viverra*, *Viverricula*, *Fossa*, *Genetta*, *Prionodon*, and *Poiana*) form a distinct and very closely allied group, the characters of which may be most conveniently given when the next set of forms has been passed in review.

The genus which it seems to me may best be taken next is the large and polymorphic genus *Paradoxurus*. It contains about a dozen (mostly more or less imperfectly defined) species, which all come from the Asiatic region, from China, Formosa, Nepal and Tenasserim, to Madras, the Andaman Islands, Ceylon, Malacca, its inner cusp is much larger relatively; it is really the larg tooth, and has three roots. $\frac{\text{M. 2}}{}$ is shaped like $\frac{\text{M. 1}}{}$, but is smalle with two outer cusps and one large inner cusp; it has two root $\frac{}{\text{P. 4}}$ is broader in proportion to its length and has less talon, but more marked anterior tubercle. $\frac{}{\text{M. 1}}$ is much broader in proporti to its length, and its cusps are less pointed and prolonged. Its talon raised to the level of the front part of the tooth, and forms the tooth hinder half with four small cusps arranged in a semicircle, while tl front half of the tooth bears three larger cusps, one foremost and tl other two side by side. $\frac{}{\text{M. 2}}$ is quinquecuspidate, with two larg cusps in front (not side by side), and three smaller ones behin arranged in a semicircle.

Comparing the deciduous teeth with those of *Viverra*, I find $\frac{\text{D.}}{}$ with less talon, $\frac{\text{D. 3}}{}$ (the deciduous sectorial) with a relativel smaller internal cusp and with the fourth cusp a little smaller This tooth is decidedly more sectorial than is the permanent sectoria tooth, its posterior cusp being relatively larger. $\frac{\text{D. 4}}{}$ is much lik that of *Viverra*, but is rather more quadrate. $\frac{}{\text{D. 2}}$ and $\frac{}{\text{D. 3}}$ have les talon than in the Civets. $\frac{}{\text{D. 4}}$ is more sectorial than the permanen sectorial tooth, and is very like that of the Civet, except that its talon is rather smaller and the tuberosities upon it (especially the innermost one of them) less developed.

As examples of the considerable differences in the forms and sizes of the teeth in different species or races, I may perhaps be permitte to remark that the British-Museum specimen called *P. macrodu* by Dr. Gray well merits its name from the large size of its teeth[1]. There is no skin of this species in the collection; and its habitat is unknown. $\frac{\text{M. 2}}{\text{M. 2}}$ are very small in the skulls named *P. larvatus* *P. grayii*, and *P. lanigera* in the national collection; and they ar rather small in *P. zeylanicus* and *P. bondar*. $\frac{\text{P. 4}}{\text{M. 1}}$ (the sectoria teeth) are very sectorial in character in the forms named *P. hermaphroditus*, *P. bondar*, and *P. lanigera*. They are, on the othe hand, more quadrangular and very unsectorial in form in *P. macrodus*, *P. nigrifrons*, *P. larvatus*, *P. grayii*, *P. philippensis*, *P. zeylanicus* *P. leucomystax*, and *P. fasciatus*.

In the Museum of the Royal College of Surgeons there is a skull (No. 4301 B) in which $\frac{\text{M. 2}}{\text{M. 2}}$ are entirely absent. It comes from Nepal.

In the British Museum there is also a skull (No. 154 *b*), which was purchased from the Zoological Society and said to have come from Manilla, in which $\frac{\text{M. 2}}{\text{M. 2}}$ are also entirely wanting[2]. But the Manilla skull has $\frac{\text{P. 4}}{}$ and $\frac{\text{M. 1}}{}$ more quadrate and $\frac{\text{P. 3}}{}$ much thicker; also $\frac{}{\text{M. 1}}$ is wider and $\frac{}{\text{M. 2}}$ is larger; and $\frac{}{\text{P. 4}}$ is wider and more

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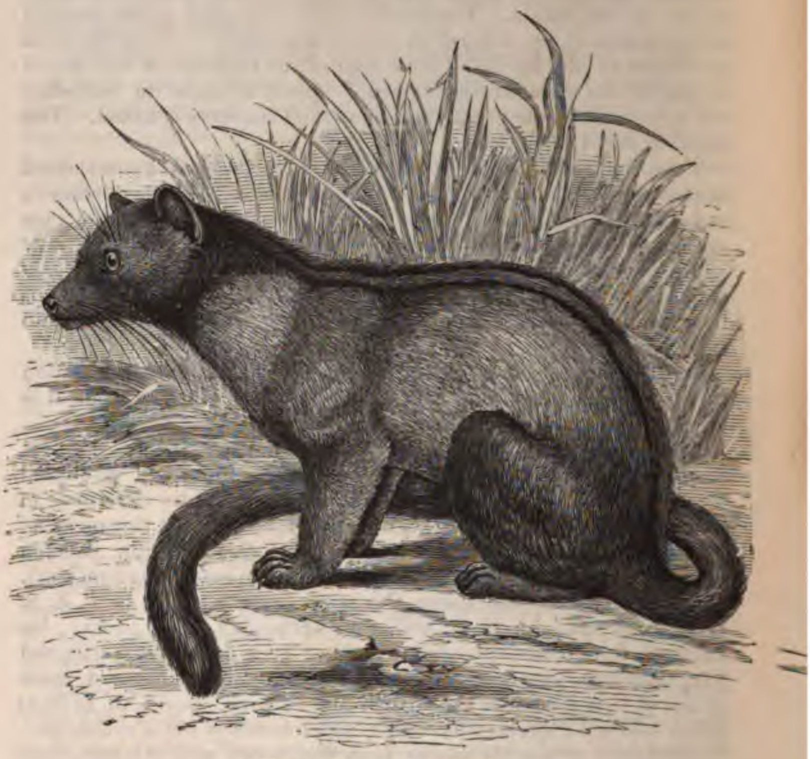
[1] P. Z. S. 1864, p. 538.

[2] On the left side of the skull there are two small holes in the place where $\frac{\text{M. 2}}{}$ would be were it present. These holes, however, look more like small fractures or some pathological condition than like alveoli.

It is by cranial and dental characters that this genus is distinguishable, as was pointed out by Dr. Peters and Dr. Gray. The palate is much more prolonged behind the last molars than in any Paradoxure. In *Paradoxurus grayii* (in which it is more prolonged than in any other Paradoxure) the first molar's length is only 10, the whole cranial length being taken at 100, whilei n *A. trivirgata* it is 12·6 or even 14·8, and in the specimen named *A. stigmatica* 13·0. Moreover the hinder portion inclines more or less strongly upwards as it proceeds backwards, and there is a deep notch with a semicircular or more than semicircular outline on each side of the prolonged median portion. The hinder portion of the alveolar border of the mandible is also singularly everted.

Fig. 8.



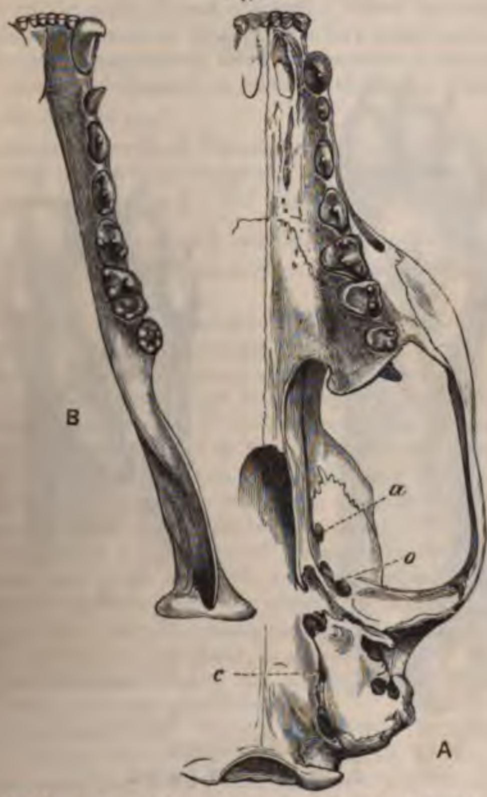
External form of *Arctogale*.

The teeth of *Arctogale* are remarkable for their small size and very unsectorial character. $\underline{\text{P. 4}}$ and $\underline{\text{M. 1}}$ are very nearly equal in size; and $\frac{\mathrm{M.\,2}}{\mathrm{M.\,2}}$ are fairly developed. In other respects the cranial and dental characters are those of *Paradoxurus*.

Temminck says nothing about the scent- or prescrotal gland, which I presume is as in *Paradoxurus*. S. Müller is also silent about it.

Arctogale, then, differs from *Viverra* as to Nos. 24, 33, 47, 48, 49, and 50.

Fig. 9.

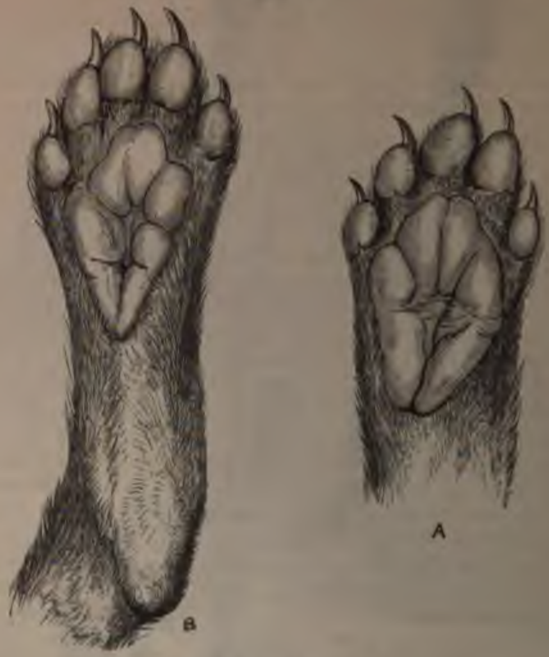


Half basis cranii (A) and half mandible (B) of *Arctogale*.
a, Anterior opening of the alisphenoid canal; *o*, foramen ovale; *c*, carotid canal.

The genus *Hemigalea* was instituted by Jourdan (Compt. Rend. 1837, p. 442, Ann. des Sc. Nat. vol. viii. p. 277) for the *Paradoxurus derbianus* of Gray (P. Z. S. 1837, p. 67, and Loudon's Mag. Nat. Hist. i. 1837, p. 579). It is the *Viverra hardwickii* of Gray (Spic. Zool. ii p. 9, t. i.), the *Viverra boiei* of S. Muller (Zoog. Ind. Archip. p. 121, t. xviii., which contains a representation of the external form, skull, and dentition), and the *Hemigale zebré* of the

'Voyage de la Bonite,' p. 28, pl. v., which is a good coloured representation of the animal, with outline of skull and teeth, which are also figured (under the name *Paradoxurus derbyanus*) on pls. vii. and xii. of De Blainville's 'Ostéographie' (*Viverra*). It is an inhabitant of Malacca and Borneo. It differs strikingly from most other *Viverridæ* by its system of coloration, as it has transverse stripes instead of longitudinal markings and spots. It is in this respect only approached by the Linsangs. Its ground-colour is whitish yellow, with red-brown markings. The tail is ringed at its proximal part, but is black distally. There are three stripes on the head, two down the neck, and it is irregularly marked on the shoulders. The hair on the dorsum of the neck is reversed in direction. The claws are sharp and retractile.

Fig. 10.



Pads of *Hemigalea*.
A, left manus; B, left pes.

The pads, besides those beneath the five toes, are concentrated, so as to form a considerable naked space (pointed upwards) on the metatarsus, while the tarsus is almost, if not quite, entirely hairy. No hairy interval divides the proximal and distal portions of the palmar pad. The claws are strongly arched (*cf.* fig. 14 D, p. 192.

The pollex and hallux are very well developed.

In its cranial characters *Hemigalea* resembles *Paradoxurus*. Its bulla is of the same form, but ankylosed into one piece. The paroccipital is depending, the mastoid very slightly marked; there is an alisphenoid canal; and the condyloid foramen is concealed; but the hinder opening of the carotid canal is rather more anteriorly situated with respect to the bulla. Its anterior end notches the alisphenoid as always hitherto. The postorbital processes are very small, that of the malar almost obsolete. When the skull is looked at in profile, the dorsum of the muzzle is very concave, and a deepish groove runs antero-posteriorly along the junction of the nasal bones. There is a peculiar depression or notch in the upper alveolar border to receive the apex of $\frac{}{\text{P. 2}}$.

The teeth are the teeth of *Paradoxurus*; but the outermost upper incisor of each side is more separated from the incisor next it, and $\frac{\text{M. 2}}{\text{M. 2}}$ are very well developed. $\frac{\text{P. 3}}{}$ has a distinct internal tubercle; and there is even a very small one to $\frac{\text{P. 2}}{}$. $\frac{}{\text{P. 2}}$ is very much extended vertically, and is received into the upper alveolar notch just mentioned.

Length of head and body about 38″·1; of tail 40″·6.

Nothing is said as to any scent-gland in the 'Zoology of the Voyage of the Bonite;' nor do I find any other notice about it. In a female specimen most kindly presented to me by Mr. A. D. Bartlett, and which I dissected (portions of its anatomy being preserved in the museum of the Royal College of Surgeons), I found superficial folds something as in *Genetta*—two oblique shallow folds extending obliquely upwards and outwards from near the anus to the vicinity of the vagina. The secretion could be squeezed into these folds, just as in the specimen I examined of *Genetta tigrina*. The tongue exhibited an oval patch of much enlarged but soft papillæ on the anterior half of the dorsum of that organ.

A very peculiar plate-like enlargement of the radius is to be found on its outer border a little above its styloid precess. Into this are inserted the *supinator longus*, the *pronator radii teres*, and, especially, the large *pronator quadratus*.

Hemigalea agrees with *Viverra* as to the characters so often referred to, except Nos. 2 (perhaps), 24, 42, 43, 51, 52, and 53.

The Binturong (*Arctictis*), the systematic position of which was for a time so much mistaken, is a good example of the small value of dental characters as guides to the essential affinity of an animal.

Were it not for *Arctogale* (which tends to bridge over the dental differences between *Arctitis* and *Paradoxurus*), the Binturong would be an exception amongst the *Viverridæ*, something as *Proteles* is amongst the *Hyænidæ*. *Arctitis* may be confidently affirmed to be an aberrant Paradoxure. The animal seems to have been first described by Sir Stamford Raffles (as *Viverra binturong*) in the Trans. Linn. Soc. vol. xiii. p. 253.

The genus *Arctictis* was instituted by Temminck, who gives it in the 'Tableau Méthodique' (1827), p. xxi, in the beginning of his first volume of the 'Monographie,' in the second volume of which, p. 305, is a full description, with a figure of the skeleton half the size of nature, and one of the skull and dentition of the natural size. De Blainville, in his 'Ostéographie' (*Subursus*), gives a figure of the entire skeleton on pl. 4, of the skull and dentition on pl. 7, with some details of the axial skeleton on pl. 8, of the appendicular skeleton on pls. 9 & 10, with the adult and milk-dentition on pl. 11. F. Cuvier has figured the dentition in the 'Dents des Mammifères,' pl. 3 *bis*. F. Cuvier also figured the animal (Mém. du Mus. vol. ix. p. 44, t. 4) under the name *Paradoxurus albifrons*; and another figure of a semi-adult individual (under the name Binturong) in his 'Mammifères,' vol. ii. Valenciennes has also figured it (under the name *Ictides albifrons*) in Ann. des Sc. Nat. vol. iv. p. 57, pl. 1. In the 'Journal of the Asiatic Society of Bengal,' vol. xv. 1846, p. 192, there is a short but interesting account of the animal. It is referred to in S. Müller's 'Zoog. Ind. Archipel,' p. 32. The anatomy of this animal has been described by the late Prof. Garrod in P. Z. S. 1873, p. 196, with a further note (as to the occasional absence of the cæcum[1]) in 1878, p. 142.

The animal comes certainly from Borneo; and some say, from Java, Sumatra, and Malacca also.

The ears are tufted, the tail long and, to a certain extent, prehensile; and the tarsus and metatarsus are both entirely naked. As to the cranium, the bulla is formed on the type of that of *Paradoxurus*, except that the two parts are completely ankylosed in the adult. There is an alisphenoid canal, but no pterygoid fossa. The external opening of the auditory meatus is small and oval. The postorbital processes are very short and blunt (the malar hardly indicated); and the cranium is not laterally constricted behind them. The condyloid foramen is concealed. The cranial ridges are not largely developed; but the paroccipital process depends, and the mastoid is rather marked. The carotid canal opens posteriorly at the middle of the inner side of the auditory bulla, while anteriorly it notches the alisphenoid. There is no foramen or fissure in the floor of the auditory bulla's anterior chamber; but there is a very deep pit (to receive the cornu of the hyoid) on the side of the bulla just behind the external auditory opening. The palate is greatly prolonged behind the hindmost molars. The angle of the mandible is very small. The zygomatic arches present a rather concave instead of a convex outline medianly when viewed from above or below. The premolars and molars are small and separated one from another by small but marked intervals. The number of teeth varies slightly, as either $\frac{M.2}{\quad}$ or $\frac{P.1}{\quad}$ may be wanting, and (according to Raffles) there may be six teeth in the lower jaw; *i. e.* $\frac{\quad}{P.1}$ is probably present sometimes, though I have never seen it. $\frac{\text{M. 2}}{}$, if present, is very small, one-rooted, and much less than half the size of $\frac{\text{M. 1}}{}$. $\frac{\text{M. 1}}{}$ is much like the same tooth in *Paradoxurus*, but is less transversely extended in proportion to its length; it has three tubercles and three roots. $\frac{\text{P. 4}}{}$ is like that of *Paradoxurus*, save that it is modified by the very great reduction of the foremost and hindmost outer cusps, which are each connected by a ridge (the cingulum) with the largely-developed inner cusp. $\frac{\text{P. 3}}{}$ is a trihedral tooth with rounded angles; $\frac{\text{P. 2}}{}$ is similar but smaller; and $\frac{\text{P. 1}}{}$ may be wanting, but if present is long and conical. $\frac{}{\text{P. 1}}$ is wanting. $\frac{}{\text{P. 2}}$, $\frac{}{\text{P. 3}}$, and $\frac{}{\text{P. 4}}$ are conical teeth, increasing in breadth progressively backwards. $\frac{}{\text{M. 1}}$ is much as in *Paradoxurus*, but is broader in proportion to its length. The talon does not form quite half the tooth. $\frac{}{\text{M. 2}}$ is more rounded than generally in *Paradoxurus*; it is not much smaller than $\frac{}{\text{P. 4}}$. As to the milk-dentition, the deciduous upper sectorial $(\frac{\text{D. 3}}{})$ is much more sectorial than is the permanent sectorial tooth. It is very narrow from side to side, having either a mere rudiment of an internal cusp or none. $\frac{\text{D. 4}}{}$ is quite like $\frac{\text{M. 1}}{}$. $\frac{}{\text{D. 4}}$ is rather more sectorial than is $\frac{}{\text{P. 4}}$. The infraorbital foramen opens above $\frac{\text{P. 4}}{}$. $\frac{}{\text{P. 4}}$ does not bite at all against $\frac{\text{M. 1}}{}$ but against $\frac{\text{P. 3}}{}$ and $\frac{\text{P. 4}}{}$.

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[1] That there is much variation as to this part is shown by the record, in vol. xv. p. 193 of the 'Journal of the Asiatic Society of Bengal,' that the cæcum is half an inch long.

The pollex and hallux are very well developed. The claws are strongly arched and pointed (*cf.* fig. 14 C, p. 192), and more or less retractile.

There is a prescrotal gland, which exudes its secretion into a naked cutaneous invagination placed, like a vulva, in front of the anus.

Arctictis agrees, so far as I can ascertain, with *Viverra*, except in the characters numbered 9, 17 (sometimes), 24, 28 (sometimes), 33, 37, 43, 45 (often), 47, and 50.

The next form is one the nature and affinities of which are to me doubtful. It has, however, so much the general appearance and character of the Paradoxures (with which it was at first associated) that I feel compelled to place it in proximity to them, in spite of the very exceptional character of the auditory region of its cranium. Indeed the non-ossification of parts of its bulla may be taken as a great exaggeration of that separate, movable condition of its hinder chamber which we have seen to be the case in *Paradoxurus*. Its claws are like those of the last-mentioned genus, as also the naked condition of its tarsus and metatarsus.

The genus *Nandinia* was instituted by Gray (P. Z. S. 1864, p. 529) for the species previously described by him as *Paradoxurus? binotatus* (P. Z. S. 1832, p. 68) and *P. hamiltonii* (P. Z. S. 1852, p. 67, and Illus. Indian Zool.). It is the *P. binotatus* of Temminck ('Monographie,' vol. ii. p. 336), who figures the skull (pl. 65. figs. 7, 8, & 9) and refers to it in his 'Esquisses Zool.' p. 119. Its external form is represented in Gray's 'Illustrations of Indian Zoology.'

The skull and teeth are figured by De Blainville, 'Ostéographie,' *Viverra*, pls. 6 & 12, under the name *Paradoxurus hamiltoni*. There is a short description of its anatomy, by Prof. Flower, in P. Z. S. 1872, p. 683.

It comes from Fernando Po and Western Africa, and also, it is said, from Zanzibar.

The Viverrine section of the *Viverrinæ* are rather more African than Asiatic; but this is the only African form of the Paradoxurine section of that subfamily. It seems to be a Paradoxure separated from the others by a more carnivorous dentition, and from all other Æluroidea by the non-ossification of the hinder and larger portion of the auditory bulla, which remains cartilaginous.

There is but one known species, the head and body of which measure about 43″·2, and the tail 30″·5. It is of a greyish-brown colour, black-spotted, and with the tail indistinctly ringed. There are three short black stripes on the nape (one from the forehead and one from each ear); and there is a yellow spot on each shoulder. The belly is dirty white. The tarsus and metatarsus are about as bald as in *Paradoxurus*. The muzzle is shorter than in any other of the *Viverridæ*. Not only is the hinder part of the bulla cartilaginous, but its anterior part is rather more bullate than (at least generally) in *Paradoxurus*. The opening of the auditory meatus is not large. There is no pterygoid fossa. The postorbital processes are long and pointed; and the skull is much contracted just behind them. The sagittal and lambdoidal ridges, especially the latter, are largely developed. The muzzle is relatively shorter than in any other Viverrine yet reviewed. The paroccipital appears to be depending (though this cannot be asserted in the absence of the bulla); and the mastoid is larger than in any genus as yet here noticed. There is an alisphenoid canal close to the foramen ovale; and the condyloid foramen is very much exposed. There is no anterior carotid foramen other than the usual foramen lacerum. The ascending ramus of the mandible is flattened beneath in a way not existing in any genus yet reviewed, and certainly not in *Paradoxurus*; and the angle is pressed up exceptionally towards the condyle. The teeth are formed on the type of those of the Genet, but are modified in a more sectorial direction. $\frac{\text{M. 2}}{}$ is very minute, and sometimes aborts altogether[1]. $\frac{\text{M. 1}}{}$ is smaller than in the Genets. $\frac{\text{P. 4}}{}$ has a posterior cusp as large as in the Genets, and the inner cusp even a little smaller. $\frac{}{\text{M. 1}}$ has its talon much smaller than in *Genetta*; and $\frac{}{\text{M. 2}}$ is a rounded rudimentary tooth, smaller than that of the Genets.

No infraorbital foramen opens above $\frac{\text{P. 3}}{}$; and $\frac{}{\text{M. 1}}$ bites against $\frac{\text{P. 4}}{}$.

There is no cæcum, as was ascertained by Prof. Flower[2]. I can find no record as to the existence of prescrotal[3] or anal glands.

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[1] As on both sides of a skull in the Royal College of Surgeons' Museum, and on one side of another skull there.

[2] P. Z. S. 1872, p. 683.

[3] Through the kindness of Mr. Forbes I have been able to ascertain the presence, in a female *Nandinia*, of a bald patch, no doubt glandular, in the situation of the prescrotal glandular structure of *Genetta*.

The tongue is much like that of the Civet, and with no patch of greatly enlarged papillæ on its anterior half.

The characters before given of *Viverra* apply also to *Nandinia*, except nos. 3, 7, 14, 24, 28, 35, 37, 38, 40, 42, 43, 45 (sometimes), 46, and 54.

With *Nandinia* closes the second set of forms of the subfamily *Viverrinæ*; and the characters of these two sets may be expressed as follows:—

In the Viverrine section of the *Viverrinæ* we find:—

(1) Auditory bulla entirely ankylosed into one mass.
(2) Bulla not always, or greatly, narrowing anteriorly.
(3) Palate never much prolonged beyond hindmost molars.
(4) Mastoid never very prominent.
(5) A cæcum constantly present.
(6) Teeth always sectorial, never very small; anterior premolars not very long.
(7) Margins of palate not nearly parallel.
(8) A supracondyloid foramen to the humerus.
(9) A median groove beneath the nose on the upper lip.
(10) Tarsus and metatarsus often entirely hairy, never entirely naked.
(11) Tail long.

In the Paradoxurine section we meet with the following characters:—

(1) Auditory bulla often in two pieces; hinder chamber in one species not ossified.
(2) Bulla, when ossified, always greatly narrowing anteriorly.
(3) Palate sometimes much prolonged beyond last molars.
(4) Mastoid in one form very prominent.
(5) Cæcum sometimes absent.
(6) Teeth sometimes but little sectorial and occasionally very small; anterior premolars not very long,
(7) Margins of palate not nearly parallel.
(8) A supracondyloid foramen to humerus.
(9) A median groove beneath the nose, on the upper lip.
(10) Tarsus and metatarsus often entirely naked, never entirely hairy.
(11) Tail long.

The genus *Cynogale* was founded by Gray[1] on a skin in the collection of our Society, supposed to have formed part of the collection of Sir Stamford Raffles, and therefore to have come from Sumatra. It was described and figured in 1837 by De Blainville, under the name *Viverra carcharias*, who gives some anatomical details (Ann. Sc. Nat. 2ᵉ sér. vii. p. 280, pl. 8); and in 1839 by S. Müller (Zoog. Ind. Archip. p. 115, pl. 17, showing the external form, skull, and dentition), under the name *Potamophilus barbatus*; and in 1841 by MM. Eydoux and Souleyet (in 'Voyage de la

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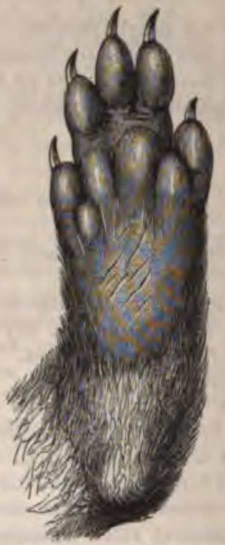
[1] P. Z. S. 1836, p. 88.

Bonite,' p. 24, pl. 6), who have given an excellent figure of the external form, with an outline of the skull and teeth. The entire skeleton is represented by De Blainville on pl. 3 of his 'Ostéographie' (*Viverra*); while its skull is admirably figured in profile on pl. 7, the atlas, axis, sternum, and hyoid on pl. 9, its appendicular skeleton on pls. 10 and 11, and its dentition, both young and adult, on pl. 12.

The animal comes from Borneo. It was erected by Dr. Gray, first into the tribe *Cynogalinæ*[1] and then into the family *Cynogalidæ*[2], mainly on the ground of the nose having no median groove beneath it, a character very useful for zoological purposes, but, as it appears to me, trivial as the mark of a family or subfamily. I do find, however, a groove beneath the nose, though none on the upper lip.

Fig. 11.



Pads of left pes of *Cynogale*.

Its webbed feet, short tail, long moustaches[3], together with its exceptional upper lip, serve, however, to mark it as a very distinct genus, as does also the absence of the supracondyloid groove of the humerus. The feet are much less bald than in *Arctictis*. The metatarsus, indeed, is hairless; but the tarsus is clothed beneath with short hairs. The claws are rather elongated (*cf.* fig. 14 E).

The pollex and hallux are very well developed.

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[1] P. Z. S. 1864, p. 521.

[2] Cat. of Carnivora, p. 78.

[3] When the head of this animal is viewed from above (as in S. Müller's figure) it presents a singular resemblance to the head of *Potamogale*.

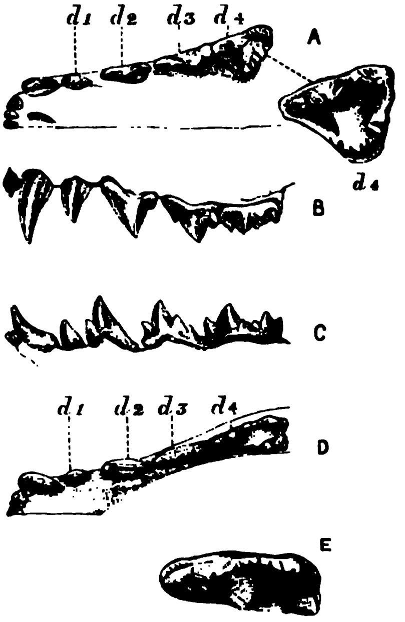
The colour of the coat is red-brown, with no markings save a very narrow black line along the crown of the elongated head. The ears are small, the whiskers very long. The hair is crisp, short, and thick. The tail is very short, tapering rapidly. A bunch of whisker grows from below each ear as well as on each side of the nose. The claws are strong, sharp, and retractile. Length of head and body about 68″·5, that of tail about 14″·5.

The cranium is of an intermediate type—somewhat Civet-like and Paradoxure-like. The bulla is shaped like that of the Civet, but is less prominent. The anterior part of it is especially flattened. The opening of the external auditory meatus is small. The postorbital processes are very small indeed; but the skull is extremely narrowed and pinched in behind them. The condyloid foramen is quite concealed. The sagittal ridge is pretty well developed, and the lambdoidal ridge is very large. The paroccipital is depending. The mastoid is prominent, though not so markedly so as in *Nandinia*. There is an alisphenoid canal which opens posteriorly opposite and close to the foramen ovale. The carotid canal opens posteriorly near the middle of the inner margin of the larger chamber of the bulla; while anteriorly the carotid artery enters by the foramen lacerum, notching the sphenoid. There is a pterygoid fossa, and a very large infraorbital foramen, which opens above the $\frac{\text{P. 4}}{}$. The palate is exceptional in shape, having nearly parallel lateral margins. Dentally, *Cynogale* is a much modified Paradoxure. The differences are mainly as follows:—$\frac{\text{M. 2}}{}$ is relatively larger and more nearly equal to $\frac{\text{M. 1}}{}$. $\frac{\text{M. 1}}{}$ is almost quite as large as $\frac{\text{P. 4}}{}$, which has its inner tubercle still larger in proportion to the rest of the tooth than in *Paradoxurus*. It has three external cusps, the first and third being largely and equally developed, and the middle cusp not descending very much below them, a form of tooth unlike that of any other yet here-described Viverrine animal. $\frac{\text{P. 3}}{}$ is of very great vertical extent (relatively greater than any yet described here); and the same may be said of $\frac{\text{P. 2}}{}$, which is somewhat recurved towards its apex. $\frac{\text{P. 3}}{}$ is a longish caniniform tooth, recurved towards its apex and placed close behind the canine. The lower premolars are correspondingly developed. $\frac{}{\text{P. 3}}$ has two small posterior basal cusps. $\frac{}{\text{P. 4}}$ has a very long talon with two cusps (one before the other), and then also an accessory anterior cusp. $\frac{}{\text{M. 1}}$ has a talon which is so large that it forms half the crown of the tooth, and bears three or four tubercles.

As to the milk-dentition, $\frac{\text{D. 2}}{}$ is very much like $\frac{\text{P. 2}}{}$. $\frac{\text{D. 3}}{}$ is intermediate in character between $\frac{\text{P. 3}}{}$ and $\frac{\text{P. 4}}{}$, but is more like $\frac{\text{P. 3}}{}$. Instead of being much like the permanent sectorial (as in *Genetta* and so many other forms), its very small inner tubercle is placed inside quite the hindest part of the tooth. $\frac{\text{D. 4}}{}$ is very peculiar: it is like the permanent sectorial, but with the inner part rather more posterior in position, and with a talon (bearing an inner and outer tubercle and a posterior cingulum) added on behind it. $\overline{\text{D. 1}}$ is like $\overline{\text{P. 1}}$, and $\overline{\text{D. 2}}$, is like $\overline{\text{P. 2}}$, with a small basal anterior cusp added. $\overline{\text{D. 3}}$ is like $\overline{\text{P. 4}}$, only with rather more talon; but $\overline{\text{D. 4}}$ is a quite extraordinary tooth: it is like $\overline{\text{D. 4}}$ of *Genetta*, with the addition of an enormous talon bearing five tubercles, three external and two internal; it is like both $\overline{\text{P. 4}}$ and $\overline{\text{M. 1}}$ of the permanent dentition ankylosed together, only the three anterior cusps are not in the same antero-posterior line as they are in $\overline{\text{P. 4}}$.

I can find no record as to the existence of any prescrotal gland, or as to the condition of its anal region. De Blainville says that "la langue est garnie de papilles cornées," that the large intestine is 6 inches long, the cæcum 6 lines, and the small intestine 4 inches.

Fig. 12.



Milk-teeth of *Cynogale*.

A. Grinding-surface of upper series, with the addition of d_4 twice the natural size. B. Side view of upper series. C. Side view of lower series. D. Grinding-surface of lower series. E. Fourth lower molar, twice the natural size.

Cynogale, so far as known, agrees with *Viverra* in the characters before given, except as regards nos. 23, 24, 35, 37, 40, 43, 44, 47, 55, and 56.

The characters of this small third section of the Viverrine subfamily may be thus drawn out:—

(1) Auditory bulla ossified and in one piece.
(2) Bulla narrowing and much flattened anteriorly.
(3) Palate not much prolonged behind last molars.
(4) Mastoid rather prominent.
(5) Cæcum very small.
(6) Teeth suited for catching fish; anterior premolars very long.
(7) Margins of palate nearly parallel.
(8) No supracondyloid foramen to humerus.
(9) No median groove on upper lip.
(10) Tarsus hairy; metatarsus naked.
(11) Tail short.

The following characters are common to the *Viverrinæ*:—

(1) Claws strongly curved, sharply pointed, and more or less deeply retractile.
(2) Orbits never enclosed by bone.
(3) Hinder chamber of auditory bulla never everted outwards.
(4) Posterior margin of the external auditory meatus as prominent as, or more so than, the anterior or inferior margin.
(5) Floor of external auditory meatus and adjacent part of bulla neither fissured nor with a foramen or a deep pit on its surface.
(6) Angle of mandible never everted.
(7) Mastoid rarely prominent.
(8) Paroccipital processes almost always depending.
(9) Aperture of external auditory meatus not triangular.
(10) Alisphenoid canal generally elongated.
(11) Carotid canal notching the sphenoid, and not showing as a conspicuous foramen in the basis cranii.
(12) Prescrotal scent-glands generally present.
(13) Anus opening on the surface, and not into a cutaneous invagination[1].
(14) Only a pair of anal glands.
(15) A supracondyloid foramen to humerus, save in *Cynogale*.
(16) An alisphenoid canal present, save generally in *Viverricula*, where, when absent, its place is not indicated by bony processes.
(17) Both pollex and hallux present.
(18) Cæcum sometimes absent.
(19) Tarsus and metatarsus hairy or bald.

The very large and polymorphic genus *Herpestes* was divided by Dr. Gray (P. Z. S. 1864, and Cat. Carnivora, p. 154) into the genera *Urva*, *Athylax*, *Calogale*, *Galerella*, *Calictis*, *Ariela*, *Ichneumia*, *Tæniogale*, *Onychogale*, and *Helogale*. Not one of these, save possibly the last, can be maintained as a distinct genus. Mr. Oldfield Thomas, who has been working with great care at these animals, told me he had come to this conclusion; and my examination of the skins and skulls in the British Museum has only served to confirm the justice of this view.

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[1] I give this character with hesitation, from what I have (as before said) observed in a living *Paradoxurus*.

The genus is found in South Europe, all Africa, Asia Minor, Persia, and nearly the whole of the Oriental zoological region, and Foochow.

The genus contains about twenty-one species, of which thirteen are Asiatic and seven African.

The Asiatic species (thirteen in number) have been carefully worked out by Dr. J. Anderson[1]; for the rest (the African seven species) I may refer to Mr. Oldfield Thomas's paper, recently read before this Society[2].

All the species have five digits to each foot; but the pollex and hallux are very small. The claws are longer and less curved than are those of the genera as yet described (*cf.* fig. 14 G, p. 192). The body and tail are always long, and the legs short. The amount of hair to be found beneath the tarsus varies much. Generally both the tarsus and metatarsus are naked beneath; but in some individuals of a species in which these parts are naturally naked, the tarsus may be more or less hairy, the hairy part having an ill-defined limit. Thus the specimen of *Herpestes paludosus*[3] (No. 61. 6. 1. 3) has the tarsus hairy beneath, while in another specimen it is quite naked.

The hair of the body is generally clothed with annulated fur, without any special markings on either shoulders, sides, or belly; while a few have neck-markings, and one or two species have uniformly-coloured fur. In all the African forms the hair seems to be more or less annulated; but in three Asiatic species it is not so. The ears are short and rounded. There is no scent-gland between the penis and testes; but the anus often opens into the middle of a sac-like depression, deepest on its hinder side, into which depression more or less numerous anal glands and glandular follicles open.

The skull is elongated, with postorbital processes which are long and pointed, generally enclosing the orbit posteriorly, though sometimes not nearly joining the malar. As Prof. Flower has pointed out[4], the auditory bulla is somewhat pear-shaped—the larger, rounded end being turned backwards and somewhat outwards, a well-marked transverse constriction separating the hinder (and here outer) chamber from the (also dilated and bullate) anterior (and inner) chamber. As Prof. Flower has also remarked, the aperture of communication in the osseous partition between the two chambers is rather larger than in the Civets, Genets, and Paradoxures.

There is always an alisphenoid canal; but this is very short. The external auditory opening is very small and triangular, one angle being directed downwards. There is a foramen or a notch in the floor of the anterior (and inner) chamber of the bulla a little within the opening of the auditory meatus; and thus we have here an incipient defect of ossification in the floor of that passage; in *Herpestes urva* this defect is more marked, being rather a fissure than a foramen. The anterior margin of the external auditory opening is slightly more produced than is the posterior one. The pterygoid fossa is small or absent. The condyloid foramen is concealed. The cranium is much pinched in behind the postorbital processes. The cranial ridges are small or moderate. The paroccipital processes do not depend. The mastoid is considerably developed (as in *Cynogale*), forming a considerable external ridge. The carotid canal begins near the anterior end of the inner wall of the hinder (and outer) chamber of the bulla. It opens anteriorly at the outer or inner end of the anterior (and inner) chamber; and there is a mostly conspicuous foramen in the basis cranii between the alisphenoid close to the basisphenoid, through which the internal carotid artery passes up into the cranial cavity beside the hinder part of the sella turcica. The palate is greatly prolonged behind the last molars. The infraorbital foramen opens generally above $\frac{\text{P. 3}}{}$.

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[1] 'Zoology of Western Yunnan,' p. 168.

[2] On Jan 3, 1882.

[3] Or *H.* [illegible]. This is the Vansire of Buffon, Hist. Nat. vol. xiii. p. 157, pl. 21.

[4] P. Z. S. 1869 p. 20 and fig. 9.

In dentition *Herpestes* generally much resembles *Genetta*, especially in the excessive transverse extension of $\frac{\text{M. 1}}{}$ and $\frac{\text{M. 2}}{}$. Sometimes, as in *H. persicus* (No. 1436 *b* in the British Museum), $\frac{\text{M. 2}}{}$ is very minute; and occasionally, as in *H. smithii* (No. 979 *a*, the skin also in the collection), $\frac{\text{M. 2}}{}$ is wanting (with no trace of an alveolus) on one side, and very minute on the other. Generally $\frac{\text{M. 2}}{}$ has two small outer and one large internal cusps. Generally also $\frac{\text{M. 1}}{}$ is more transversely extended and more trihedral than in any yet here described genus, and its posterior margin is rather more concave; otherwise it is shaped as in *Genetta* and *Viverricula*. $\frac{\text{P. 4}}{}$ is quite like the homologeus tooth of the Genets. $\frac{\text{P. 3}}{}$ is somewhat broader behind than in *Genetta*, and has a small posterior inner cusp; and it is therefore more like the $\frac{\text{P. 3}}{}$ of *Paradoxurus*. $\frac{\text{P. 2}}{}$ is much as in *Viverra*. $\frac{\text{P. 1}}{}$ is smaller, and may be absent altogether (as in No. 4324 of College of Surgeons' Museum and No. 148 *c* of British Museum). The teeth of the lower jaw are like those of the Genet, except that the inner cusp of $\frac{}{\text{M. 1}}$ is rather more developed. $\frac{}{\text{P. 4}}$ is rather broader posteriorly, and $\frac{}{\text{P. 1}}$ is sometimes wanting. The teeth of *H. paludosus* are exceptionally stout, as are also those of *H. robustus*, which are represented in P. Z. S. 1864, p. 558, and Cat. of Carniv. p. 157.

The teeth of *Herpestes* are represented by De Blainville, 'Ostéographie' (*Viverra*), pl. 12, the entire skeleton on pl. 1, and skulls and parts of the appendicular skeleton on intermediate plates. For the basis cranii see P. Z. S. 1869, p. 21, fig. 9.

H. galera is the Vansire of Buffon (Hist. Nat. t. xiii. pl. 21). *H. sanguineus* is figured in Rüppell's 'Fauna of Abyssinia,' pl. 8, and the skull on pl. 10; *H. mutgigella*, pl. 9. fig. 1; *H. gracilis*, pls. 8 & 10; *H. undulatus* and *H. ornatus* (external forms, skulls, and foot-pads) on pls. 25 and 26 of Peters's 'Reise nach Mossambique;' *H. smithii*, P. Z. S. 1851, pl. 31; *H. albicaudus*, Mag. de Zool. 1839, pl. 11; and *H. albescens*, loc. cit. pl. 12; *H. vera*, Calcutta

Journ. Nat. Hist. ii. pl. 13. fig. 2; *H. villicollis*, Madras Journal, 1839, pl. 2. M. Chatin, in vol. xiv. (1874) of the 5th series of the Ann. des Sc. Nat. pp. 79–88, figs. 34–37, describes and figures the anal glands of three species of *Herpestes*. Horsfield describes the anal pouch of another under the name *Mangusta javanica*.

The pupil contracts so as to present a horizontally extended aperture; at least it does so in living examples examined by me and Mr. Bartlett. In *H. auropunctatus* the anus opened most distinctly on the surface of the body, and not into a saccular depression. This fact, and the difference of the teeth in different species, incline me to believe that the genus will hereafter be divided into two or more genera when the structure of all the forms has been thoroughly worked out.

The genus *Herpestes* exhibits the characters before enumerated as existing in *Viverra*, except nos. 18, 20, 21, 22, 24, 26 (often), 29, 30, 31, 32, 33, 35, 36, 37, 38, 40, 42, 43, and 53.

The (to me doubtful) genus *Helogale* was founded by Gray[1], and contains two species, *H. parvula*, from Natal and other parts of South Africa, and *H. undulata* from Mozambique. It is a very small, herpestiform animal, with a bald or nearly bald tarsus. Both its cranial and dental characters are those of *Herpestes*, save that both $\frac{\text{P. 1}}{\text{P. 1}}$ are wanting, while at the same time $\frac{\text{P. 1}}{}$ is placed close behind the canine, so that there is no diastema. The length of the head and body is 25″, of the tail 13″.

The genus *Cynictis* was instituted by Ogilby in 1833[2], who has figured the skull and external form in the first volume of our 'Transactions.' There is one species which comes from South Africa. It is of a reddish colour with more or less annulated hair and a bushy tail, with a tarsus which seems to be constantly very hairy; and the metatarsus is also hairy. The animal is herpestiform, but slender, and has no hallux; and the pollex is very short. The orbits are completely encircled by bone; and all the cranial and dental characters are like those of *Herpestes*, save that the infraorbital foramen opens above the interval between $\frac{\text{P. 3}}{}$ and $\frac{\text{P. 4}}{}$, and $\frac{}{\text{M. 2}}$ is rather larger. Its outer internal cusp is more prominent, and sometimes bifurcates at its apex, as it also does in *Herpestes albicaudus* and probably in some others.

The skull (including the *basis cranii*) of *Cynictis* is figured b De Blainville, Ostéog. (*Viverra*), pl. 5; the appendicular skeleton on pls. 10 & 11, and its dentition on pl. 12.

The length of the head and body is 45″·6, of the tail 30″·4. I can find no record of the anatomy of its soft parts or the condition of the anus; but the condition of the skins seemed to me to indicate that the anus opens into a depression as in certain species of *Herpestes*. This suspicion has been confirmed by the examination of a living specimen at our Gardens. *Cynictis* agrees with *Herpestes*, save as above indicated.

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[1] P. Z. S. 1861, p. 308; see also P. Z. S. 1864, p. 570, and Cat. of Carnivor p. 169.

[2] See P. Z. S. 1833, p. 48, and Trans. Z. S. (1835), vol. i. p. 29, pl. 34.

The genus [illegible] was first [illegible] 185[illegible], and [illegible] teeth, and [illegible] Mozambique. [illegible] comes from [illegible] existence of [illegible] with longer [illegible] snout is [illegible] The [illegible] There is [illegible] fourth [illegible] so is part of the [illegible]

The skull [illegible] broader, the [illegible] resemble[illegible] Peters says — "[illegible] outer side of the [illegible] side, whilst in [illegible] and [illegible] (2) there is [illegible] tubercle placed [illegible] external [illegible] small external [illegible] *Crossarchus* and [illegible] is [illegible] thoracic, [illegible] clavicle is absent. The [illegible] 9 pairs of the [illegible] supracondyloid [illegible] a first metacarpal [illegible] ment whatever of the [illegible] *Herpestes*, [illegible] papillæ on [illegible] gated and [illegible] 135" long and [illegible] thick. The [illegible] *Crossarchus*. [illegible] and right [illegible]

In the [illegible] rhinoceros [illegible]

Length of [illegible]	[illegible]
Length of [illegible]	[illegible]
Length of the [illegible]	[illegible]
Breadth of [illegible]	[illegible]
Length of [illegible]	[illegible]

[1] [illegible]

[2] Dr. Peters says [illegible] and so I find it.

	millim.
Length of radius	54·5
Length of manus	51·0
Length of third digit	21·0
Length of femora	68·0
Length of tibia	72·0
Length of pes	82·0
Length of fourth digit of pes	23·0

Dr. Peters describes the liver as consisting of three main lobes, the middle one of which has the *ligamentum teres* on its left and the gall-bladder on its right—the left lobe being single, with the right lobe divided by notches into secondary lobes. Dr. Günther had the kindness to place at my disposal for examination the viscera of the specimen in the British Museum. Unfortunately its liver was in a very bad state and much injured; it appeared to me, however, to consist of three main lobes, corresponding respectively (1) to the left lateral, (2) to the left central, and (3) to the right central and right lateral united, and containing the gall-bladder. The caudate lobe seemed to be of much the same size as in *Herpestes*. I could not distinguish the Spigelian lobe.

Dr. Peters does not describe the anal glands; but, from the form of the anal sac, there are probably more than two pairs of them, as in *Crossarchus*.

Length of head and body 40″, of tail 30″.

There are said to be three species—two from the Mozambique, and one from the Gaboon.

Except as above pointed out, the characters of *Bdeogale* are those of *Herpestes*.

The genus *Rhinogale* was formed by Dr. Gray, in 1864 (P. Z. S. p. 573), for a rather large Herpestiform animal, brought from Eastern Africa by Dr. Meller. The skull is represented by Dr. Gray, and also in his 'Catalogue of Carnivora,' p. 173. The external form has been just represented by Mr. Oldfield Thomas in our 'Proceedings.' The creature differs from all those yet here noticed, except *Cynogale*, in that the nose has no central groove below. There is both a hallux and a pollex; the hair is annulated; and the tarsus is hairy.

The skull in the British Museum (No. 1437 *a*, from skin, 64. 8. 23. 1) has an herpestiform bulla; but the anterior chamber is very much less than the posterior one. The external auditory meatus is small and triangular, with one angle downwards. The postorbital processes of the frontal nearly join the much smaller ones of the malars. The condyloid foramen is exposed. The lambdoidal ridge is rather large, and the sagittal ridge moderate. The paroccipital process does not depend. The mastoid is much as in *Herpestes*; the pterygoid processes are very long, and the pterygoid fossæ very small. There is a distinct, but very short, alisphenoid canal. The carotid canal is as in *Herpestes*. The anterior part of the bulla has a distinct round perforation in its floor, just below and within the of the meatus auditorius externus. The muzzle is short; but ate is much prolonged behind the last molars.

lentition, compared with that of *Herpestes*, presents the following characters:—$\underline{\text{M. 2}}$ is more quadrate and more nearly equal to $\underline{\text{M. 1}}$. $\underline{\text{M. 1}}$ is very quadrate. $\underline{\text{P. 4}}$ is very slightly sectorial, large internal tubercle, and resembles the same tooth in the ectorial Paradoxures. $\underline{\text{P. 3}}$ is very large, and has a well-ped internal tubercle, with a small cusp behind the large ıl one, and another small one in front of it, larger, however, ıe hindmost outer cusp. $\underline{\text{P. 2}}$ has a rudimentary internal cusp, th a minute anterior and a minute posterior external cusp. very small. Besides these four upper premolars and the , there is also a small tooth, with a minute basal cusp, close behind each upper canine; yet the skull is that of a aged individual. I regard this extra tooth as something ıal.

is much larger and more quadrate than in *Herpestes*. $\overline{\text{M. 1}}$ is ore quadrate than in *Herpestes*, and has apparently been cuspidate, but is much worn. $\overline{\text{P. 4}}$, $\overline{\text{P. 3}}$, $\overline{\text{P. 2}}$, and $\overline{\text{P. 1}}$ are much *Terpestes*. Unfortunately I have no means of ascertaining the on of the anal region. From an examination of the dry skin, us appears to me to open into a depression, as in some *Her-*

Except as above indicated, the characters of *Rhinogale* are of *Herpestes*.

gth of the head and body about 53″·1, of the tail 38″·1.

genus *Crossarchus*[1] was founded by F. Cuvier in 1825 for angue, of which he has given a figure (Mammifères, iii.). It rred to in Temminck's 'Esquisses,' p. 117. Its anatomy was ed by Mr. W. Martin (P. Z. S. 1834, p. 113). The genus is spread over Africa:—one species, *C. obscurus*, from Abyssinia mbia and the Cameroons, and another, *C. fasciatus*, from ern Africa; a third, *C. gambianus*, from Gambia; and a , *C. zebra*, from Abyssinia. All have the hair annulated, the mall and rounded, the tarsus bald; and they are devoid of a n groove beneath the muzzle. The snout is elongated, hairy th, and more or less turned upwards towards the tip. They ave a pollex and hallux; but these are shorter in *C. fasciatus* n *C. obscurus*. The claws are much elongated.

C. fasciatus there are transverse bands or lines, more or less d, across the back; these are absent in *C. obscurus*. The is round. The length of the head and body is 36″·8, of the 7″·1, in *C. obscurus*; and 45″·8 and 22″·9 in *C. fasciatus*.

e skull of the typical form, *C. obscurus*, has a bulla on the of *Herpestes*, but with its character exaggerated. There is sphenoid canal, but very short, and often imperfectly ossified; ony processes tending to enclose it may always be detected.

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[1] is genus includes the genus *Mungos*, Gray, P. Z. S. 1864, p. 575, and Cat. nivora, p. 174.

If perfect, it is very short. The opening of the external auditory meatus is small and triangular, and, as it were, somewhat cut away below: and there is a deep groove and a defect of ossification on the floor of the anterior chamber of the auditory bulla. The frontal postorbital processes are well developed; and the skull is much pinched in behind them. There are small pointed malar processes; but these do not nearly join the former. The condyloid foramen is concealed. The cranial ridges are moderate. The paroccipital process does not depend. The mastoid is much as in *Herpestes*, as also is the carotid canal: and there is a conspicuous carotid foramen in the basis cranii: and the artery enters the skull beside the posterior boundary of the sella turcica. The palate is greatly prolonged behind the last molars. In *C. fasciatus* the cranial characters are similar; except that the short alisphenoid canal is better marked, the palate is rather less prolonged, and the postorbital processes more nearly join, and there may be but a very minute foramen instead of a slit beneath the auditory meatus.

The dentition of *C. obscurus* is represented by De Blainville (Ostéog., *Viverra*, pl. 12). Its $\frac{\mathrm{M.\,2}}{}$ is quite two thirds the size of $\frac{\mathrm{M.\,1}}{}$, but is triangular, not quadrate. $\frac{\mathrm{M.\,1}}{}$ is less trihedral than in *Herpestes*, and has two equally developed external cusps, external and parallel to which is a raised straight cingulum. There is a large internal cusp; and the hinder border of the tooth is concave. $\frac{\mathrm{P.\,4}}{}$ has a rather diminished posterior tubercle (compared with *Herpestes*); so that the large inner cusp is placed rather more towards the middle of the tooth, the length of which is rather less in proportion to its breadth. The inner cusp also descends as much as do the outer ones; and the outer middle cusp scarcely descends below the anterior outer cusp. $\frac{\mathrm{P.\,3}}{}$ and $\frac{\mathrm{P.\,2}}{}$ are as in *Herpestes*. $\frac{\mathrm{P.\,1}}{}$ is wanting. $\frac{}{\mathrm{M.\,2}}$ is large, with five cusps. In $\frac{}{\mathrm{M.\,1}}$ the anterior cusp has become more decidedly internal, so that we have an external cusp opposite the internal one. There is a moderate talon. $\frac{}{\mathrm{P.\,4}}$ has one very large cusp, in front of which may be a well-developed or a minute accessory cusp, while behind it there is a well-developed cusp, which has a more or less marked talon or minute accessory cusp at its base. $\frac{}{\mathrm{P.\,3}}$ and $\frac{}{\mathrm{P.\,2}}$ are as in *Herpestes*. $\frac{}{\mathrm{P.\,1}}$ is absent. In *C. fasciatus*, $\frac{\mathrm{M.\,2}}{}$ is rather smaller in proportion to $\frac{\mathrm{M.\,1}}{}$, and $\frac{\mathrm{P.\,2}}{\mathrm{P.\,2}}$ and $\frac{\mathrm{P.\,3}}{\mathrm{P.\,3}}$ are larger. In a specimen in the British Museum, labelled *Mungos gambianus* (No. 55. 12. 24. 22 *b*), $\frac{\mathrm{M.\,2}}{}$ and $\frac{\mathrm{M.\,1}}{}$ are very narrow antero-posteriorly. In another skull, labelled *M. zebra* (No. 75. 2. 24. 18), there is a minute $\frac{\mathrm{M.\,3}}{}$ on each side, which measures 0″·1 antero-posteriorly and 0″·25 transversely.

The dimensions of the skins seen by me are as follows:—of *C. obscurus*, head and body about 37″, of tail 17″; of *C. fasciatus*, head and body about 45″·5, of tail about 23″.

The anus opens into the middle of a very large and deep fossa, into which several pairs of anal glands also open. The structure of these parts is described by M. Chatin as they exist in both species. The condition found in *C. obscurus* is described by him (in a paper entitled "Recherches pour servir à l'histoire anatomique des glandes odorantes chez quelques Mammifères") in a periodical named 'Comp. Rendu Assoc. française,' vol. i. (1872), p. 557. The parts of *C. fasciatus* are described and figured by him (under the name *Herpestes fasciatus*) in the Ann. des Sc. Nat. vol. xix. (5th series), 1874, p. 89, figs. 29–33, and 38.

No less than five pairs of glands are arranged about the anus, and pour their secretion into the capacious and naked anal pouch.

C. fasciatus is described and figured in Buffon, vol. xiii. p. 150, pl. 19.

Except as above indicated, the characters of *Crossarchus* are (so far as I know) those of *Herpestes*.

The Suricate was formed into the genus *Suricata* by Desmarest (N. Dict. d'Hist. Nat. xxiv. p. 16, 1804), and was called *Ryzæna* by Illiger (Prodromus, p. 134). It is figured and described by Buffon and Daubenton (H. Nat. vol. xiii. p. 72, pl. 8). Its anatomy has also been described by Hunter (' Essays and Observations,' vol. ii. p. 55) and by Prof. Owen (P. Z. S. 1830, pp. 39, 51).

The animal is from South Africa, and is called " Meer Kat" at the Cape. The hair is annulated, and so marked as to form transverse bands across the loins. The ears are very short. The tarsus is hairy. There is no pollex or hallux, there being mere rudiments of the first metacarpal and the first metatarsal beneath the skin. The nose is pointed, rather elongated and movable, and has no median groove on its underside. Length of head and body 38″·8, of tail 21″. The skull is relatively very broad, especially behind, facial portion short. The basis cranii shows the Herpestiform character of the bulla carried to a yet more exaggerated degree than in *Crossarchus*; but it is flattened beneath, and the hinder chamber does not generally depend below the anterior chamber. The opening of the external auditory meatus is small and triangular; and its anterior margin projects most.

Prof. Flower has pointed out (P. Z. S. 1869, p. 20) that the much elongated meatus is fissured along the whole extent of its floor. The anterior chamber of the bulla is very prominent; and the opening between the two chambers is rather larger than heretofore. There is a distinct but short alisphenoid canal. There are long postorbital processes which enclose the orbits; but the cranium is very little pinched in behind them. The cranial ridges are moderate. The condyloid foramen may or may not be concealed. The paroccipital process is flattened, and does not depend. The mastoid is very marked, more so relatively than even in *Nandinia*. The carotid canal commences towards the hinder end of the auditory bulla. There is a conspicuous carotid foramen in the basis cranii on either side; and it is almost, if not quite, surrounded by the sphenoid.

If perfect, it is very short. The opening of the exte
meatus is small and triangular, and, as it were, some
below; and there is a deep groove and a defect of os
floor of the anterior chamber of the auditory bu
postorbital processes are well developed; and
pinched in behind them. There are small poin
but these do not nearly join the former. The
concealed. The cranial ridges are modera
process does not depend. The mastoid is m
also is the carotid canal; and there is a con
in the basis cranii; and the artery enters th
boundary of the sella turcica. The palate
the last molars. In *C. fasciatus* the cr
except that the short alisphenoid canal
is rather less prolonged, and the post
join, and there may be but a very min
beneath the auditory meatus.

The dentition of *C. obscurus* is
(Ostéog., *Viverra*, pl. 12). Its $\frac{\text{M.}}{}$
$\frac{\text{M.1}}{}$, but is triangular, not quadrat
Herpestes, and has two equally d
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$\frac{\text{P.1}}{}$ is wanting. $\frac{}{\text{M.2}}$ is la
cusp has become more
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talon. $\frac{}{\text{P.4}}$ has one very
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well-developed cusp, w
minute accessory cusp
$\frac{}{\text{P.1}}$ is absent. In *C. f*
$\frac{\text{M.1}}{}$, and $\frac{\text{P.2}}{\text{P.2}}$ and $\frac{\text{P.3}}{\text{P.3}}$
Museum, labelled
and $\frac{\text{M.1}}{}$ are very na
M. zebra (No. 7
which measures 0

The dimensio
C. obscurus, he
head and body

and half mandible (B) of *Suri*
f, fissure in floor of auditory m

its hinder margin hardly,
tubercle still larger than in
much as does the middle on
little exceeds in size the ot
larger and stronger than in *Cro*
is much as in *Crossarchus*,
-posteriorly shorter; its tal
three cusps in a semicircle; its
side by side. The postero-intern
of *Crossarchus* has here become

$\overline{\text{P. 4}}$ has become much raised anteriorly; its talon is large, while the anterior cusp of the same tooth in *Crossarchus* here aborts. $\overline{\text{P. 3}}$ and $\overline{\text{P. 2}}$ are very long and strong. $\overline{\text{P. 1}}$ is absent.

The anus opens into the middle of a very deep fossa, deeper than that of *Bdeogale*, and like that of *Crossarchus*. There is also a curious scrotum-like prominence between the vagina and the anus. I have not met with any description of the anal glands other than that of Daubenton, who says[1]:—"Il se trouvoit de chaque côté de l'anus une poche qui avoit quatre lignes et demi de longueur, et trois lignes et demie de largeur, et trois lignes d'epaisseur; le tuyau excrétoire de chacune de ces poches aboutissoit au dedans de l'anus." I strongly suspect, from the form of the anal pouch, that there are here, as in *Crossarchus*, several pairs of anal glands. The claws of the manus of *Suricata* are enormously elongated (*cf.* fig. 14, H, p. 192). Those of the pes are much less so, but still are long.

Except as above indicated, the characters of this genus agree with those of *Herpestes*; and with it closes the list of the genera of the subfamily *Herpestinæ*.

That subfamily is divisible in various ways, according to the number of digits, the number of teeth, the presence or absence of a subnasal groove, and the number of anal glands, as follows:—

Section A. Anal glands a single pair .... *Herpestes*, *Helogale*, *Cynictis*?, *Rhinogale*?
" B. Anal glands in several pairs .. *Crossarchus*, *Suricata*, *Bdeogale*?

Or, Section A. Toes 5—5 .... *Herpestes*, *Helogale*, *Rhinogale*, *Crossarchus*.
" B. Toes 5—4.............. *Cynictis*.
" C. Toes 4—4.............. *Bdeogale*, *Suricata*.

Or, Section A. A subnasal groove ...... *Herpestes*, *Helogale*, *Cynictis*, *Bdeogale*.
" B. No subnasal groove ...... *Rhinogale*, *Crossarchus*, *Suricata*.

Or, Section A. Pm. $\frac{4}{4}$ .... *Herpestes* (generally), *Cynictis*, *Bdeogale*.
" B. Pm. $\frac{3}{3}$, $\frac{3}{4}$, no diastema .... *Helogale*, *Crossarchus*, *Suricata*.
" C. Pm. $\frac{5}{4}$[2]............... *Rhinogale*.

The characters of the subfamily *Herpestinæ* will be as follows:—

(1) Claws not strongly curved and not retractile, but pointed and very long.

(2) Orbits sometimes enclosed by bone.

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[1] Buffon's Hist. Nat. vol. xiii. p. 80.

[2] Probably an abnormalit .

(3) Hinder chamber of auditory bulla always everted.
(4) Anterior margin of opening of external auditory meatus more projecting than the posterior margin.
(5) Floor of external meatus or adjacent part of bulla with a foramen and fissure in a deep pit.
(6) Angle of mandible sometimes everted.
(7) Mastoid always prominent.
(8) Paroccipital processes depending below bulla.
(9) Aperture of auditory meatus small and triangular.
(10) Alisphenoid canal always very short.
(11) Carotid artery perforating or notching the sphenoid, there being a conspicuous carotid foramen in the basis cranii.
(12) Never any prescrotal glands[1].
(13) Anus very generally not opening on the surface of the body, but in a sac or cutaneous invagination.
(14) Anal glands sometimes in several pairs.
(15) A supracondyloid foramen to humerus.
(16) An alisphenoid canal, in rare instances not completely enclosed by bone, but then its place indicated by bony processes.
(17) Pollex alone, or both pollex and hallux sometimes absent.
(18) Cæcum always present, but small or moderately long.
(19) Tarsus and metatarsus hairy or bald.

A very different animal from any hitherto here reviewed is that to which the generic name *Galidictis* was given in 1837 by Isid. Geoff. St.-Hilaire[2], and again by him in the Magasin de Zool. 1839–1841, where the external form and skull, including the basis cranii, are well represented, and a full description given in a long note beginning on page 32. It is also the ***Mustela striata*** of Geoffroy St.-Hilaire (Cat. des Mamm. p. 98), and the ***Putorius striatus*** of Cuvier (Règne &c. 2nd edit. p. 144). The external form has been figured in our P. Z. S., 1848, pl. 1, with a short description and notes as to habits on page 21. The skull is also given by De Blainville (Ostéog., Viverras) on pl. 5, and the dentition on pl. 12, under the name *Mangusta* (*Galictis*) *striata*. There are two species, both from Madagascar—one the original *G. striata* of Isid. G. St.-Hiliare, and the other *G. vittata*, described and figured by Gray (P. Z. S. 1848, p. 21, pl. 1) the skin and the (immature) skull of which are in the national collection, where are also four skins and two skulls of the former species. The length of the head and body of the latter is about 35″·5, of the tail 33″. In each species the body bears longitudinal dark stripes on a lighter ground. The claws are long, but considerably curved (*cf.* fig. 14, I, p. 192). The claw of the pollex reaches to the end of the proximal phalanx of the index, and that of the fifth digit to the end of the proximal phalanx of the fourth digit, which is slightly longer than the index, the median being the longest. The claw of the hallux reaches nearly to the end of the proximal phalanx of the index, and that of the fifth digit of the pes nearly to the end of the second phalanx of the fourth digit, which is longer than the index and nearly equals the medius in length. The snout is very pointed in *G. vittata*, but does not appear to be so much so in *G. striata*. In both, the tail has long hairs and the muzzle is medianly grooved beneath; the tarsus is more or less completely bald. The claws are slightly more curved than in the *Herpestinæ*.

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[1] The nature of the prominence in *Suricata* has to be seen.

[2] Comptes Rendus, 2nd semestre de 1837, p. 578.

As to the skull, the auditory bulla is formed on the Herpestine type, and has a partition between its chambers, with a considerable aperture for intercommunication. There is a well-developed pterygoid fossa. The external opening of the auditory meatus is small and slightly oval, its anterior margin being produced outwards, but hardly more than is its posterior margin. The postorbital processes are only moderately developed, and do not even nearly meet; the skull is not much pinched in behind them. The paroccipital does not depend; and the mastoid is much as in *Herpestes*, as also is the carotid canal. There is no alisphenoid canal; and the foramen ovale is very near that for the entrance within the cranium of the internal carotid, which is pretty conspicuous. There is no fissure or foramen in the floor of the auditory meatus; but there is a marked depression where such a foramen is found in *Herpestes*. The palate is but little prolonged behind the molars; but this region is concave, each side of it sloping into a median depression, the cranium being turned with its base upwards. The palatine foramina are in the anterior part of the palate, which is remarkably broad. The symphysis of the mandible is extremely long, viz. $1''\cdot 7$, the length of the skull being $6''\cdot 2$. The zygomata are arched strongly outwards.

In the dentition the most noteworthy point is the large size of the canines, and especially the length, strong curvature, and stoutness of the lower ones, each having a marked prominence at the posterior part of the base of its crown. The upper outer incisors also preponderate greatly over the inner ones. The molars and premolars are formed on the Herpestine type; but $\frac{\text{P. 1}}{\text{P. 1}}$ are absent, and $\underline{\text{P. 2}}$ is close to the canine and small, though with two roots. $\underline{\text{P. 4}}$ is very sectorial; and the talon of $\overline{\text{M. 1}}$ is small. The inner condyle of the humerus is imperforate.

I can find no record of the condition of the anus, or of the number of anal glands, neither any note as to prescrotal glands. I, however, anticipate that the latter are wanting, that there is but a single pair of anal glands, and that the anus opens on the surface of the body, and not into a pouch.

Galidictis agrees, so far as I know, with *Viverra* in the characters before enumerated, save as regards nos. 7, 16, 17, 18, 20, 21, 23, 24, 29, 31, 32, 35, 36, 37, 38, 42, 43, and 53.

Another genus instituted by Isidore Geoffroy St.-Hilaire for three Viverrine animals from Madagascar, is the genus *Galidia* (Compt. Rendus, 1857, p. 580, and Mag. de Zool. 1839, pls. 14–17). The type of the genus must be taken to be that first described, namely *G. elegans*. The skull and dentition of this species are given by De Blainville (Viverras), plate 6.

G. elegans is represented in the British Museum by skins and skulls; and there is a skeleton in the Royal College of Surgeons.

The fur is of one colour, save that the tail is ringed with black, the hair not annulated. The length of the head and body is about 45″·2, and that of the tail is 30″·5. The muzzle seems rather obtuse. The claws are long, but considerably curved. The tarsus and metatarsus are covered beneath with sparse short hairs, or are more or less inclined to be bald, but are not so as in *Galidictis*.

The skull is very like that of *Galidictis*; but the muzzle and palate are narrower relatively, and the mandibular symphysis is much shorter. There is, again, no alisphenoid canal. The condyloid foramen is exposed. The palate is flat, and not concave posteriorly as in *Galidictis*. The zygomata are not quite so much arched outwards. The auditory opening is a more elongated oval. In other respects the skull is as in *Galidictis*.

As to the dentition, it is quite like that of *Galidictis*, save that the canines are smaller, especially the lower ones, the external incisors less preponderating. $\underline{\text{P. 2}}$ is smaller relatively. $\underline{\text{M. 2}}$ may be quite small and placed *within* the hinder part of $\underline{\text{M. 1}}$[1].

The preparation No. 2147 B in the museum of the Royal College of Surgeons shows that there is a single pair of rather large anal glands; and the anus does not seem to open into any cutaneous depression.

The two other species described by Isid. G. St.-Hilaire differ considerably from *G. elegans*, as that author himself pointed out, and as has been more decidedly indicated by Dr. F. A. Jentink[2]. I have not had any opportunity of examining *G. concolor*; but, on account of its declared resemblance to *G. olivacea*[3] (which is represented by skins, skulls, and a skeleton in the British Museum), it must be separated generically from *G. elegans* if *G. olivacea* is to be so separated. Now two courses seem to me feasible: one is to institute a new genus for the species *olivacea* and *concolor*; and the other is to unite *Galidia* and *Galidictis* in a single genus. But the differences between the last-named genus and *G. elegans* seem to me to be as great as those which separate *Cynælurus* from *Felis*; and as *G. olivacea* (and, as I infer, *concolor*) seems to me to differ as much from *G. elegans* as does this last from *Galidictis*, the more reasonable course seems to me to be to separate them, which I now accordingly propose to do under the generic name *Hemigalidia*.

In external characters *Hemigalidia* differs from *Galidia* in the non-annulation of the tail, in the more pointed muzzle, and especially in the less arched (more Herpestine and less Viverrine) form of its claws (*cf.* fig. 14, J and K, p. 192).

In the skull the bulla is rather more decidedly Herpestiform than in *Galidia*. The carotid foramen (for the entrance of the carotid artery) is more conspicuous; the hind part of the palate is not so uniformly horizontal; the anterior lip of the external auditory opening is more prominent; and the zygomata are much less arched outwards. $\frac{\text{M. 2}}{\text{M. 2}}$ are both relatively much larger. $\frac{\text{M. 2}}{}$ is also large relatively, while a $\frac{\text{P. 1}}{}$ is developed; $\frac{\text{P. 4}}{}$ has a larger internal tubercle; $\frac{}{\text{M. 2}}$ is also relatively larger. Dr. Jentink tells us that the teeth of *concolor* are quite like those of *olivacea*.

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[1] As in the specimens in the Roy. Coll. of Surg. museum.

[2] See 'Notes from the Leyden Museum,' vol. i. p. 131.

[3] On some notes as to the habits of these forms, see Pollen's 'Faune de Madagascar' (1868), p. 23.

It appears that it is a species of this genus which is the Vansire of Buffon (Hist. Nat. xiii. p. 167, pl. 21), as had it been *Galidia* the black-ringed tail would surely have been indicated.

These three genera seem to me to form a section apart, somewhat intermediate between the Viverrine and the Herpestine sections, though (as before said) I regard them as more nearly allied to the latter than to the former.

To the characters to be derived from digits, claws, skulls, teeth, colour, and habitat may be added that of the absence of an internal condyloid canal to the humerus. I propose then (as I before said) to separate this section as a subfamily under the name *Galidictinæ*.

The characters of the *Galidictinæ* will be as follows:—

(1) Claws not strongly curved and retractile, but yet sometimes more Viverrine than Herpestine.
(2) Orbits never enclosed by bone.
(3) Hinder chamber of auditory bulla rather crested.
(4) Anterior and posterior margins of auditory opening about equally prominent, in the anterior one slightly more so.
(5) Floor of anterior part of bulla not perforated or fissured, but deeply pitted.
(6) Angle of mandible not everted.
(7) Mastoid prominent.
(8) Paroccipital processes not depending.
(9) Aperture of auditory meatus small and oval.
(10) No alisphenoid canal.
(11) Carotid artery passing through a conspicuous foramen in the basis cranii.
(12) No prescrotal glands.
(13) Anus opening on the surface of the body, and not into a cutaneous invagination (?)
(14) One pair of anal glands.
(15) No supracondyloid foramen to humerus.
(16) No bony processes indicate the place of an alisphenoid canal.
(17) Pollex and hallux both present.
(18) Cæcum present, moderately long.
(19) Tarsus and metatarsus hairy or bald.

A more anomalous form of the Viverrine family is that which has been taken to constitute the genus *Eupleres* by its describer Doyère[1], who figured the animal and its (immature) skull. The immature skull has been also fully figured by De Blainville[2], with the skeleton of the hind leg and foot and the milk-dentition. The

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[1] Ann. Sc. Nat. 1835, iv. p. 281, pl. 18.

[2] Ostéog., Viverras, pls. 8, 11, and 12.

external form and part of the skull of an adult have been figur
Dr. Gray from a specimen now in the national collection[1];
the whole adult skeleton, skull (though not the basis cranii),
dentition have been described and figured by Paul Gervais[2].

It has been abundantly shown that this animal is not, as was a
supposed, an Insectivore, but really a Viverrine Carnivore.

Externally *Eupleres* is remarkable for its small head, very
slender, and pointed snout; but its dentition is the most anon
part of its organization so far as yet known.

The body is clothed with woolly annulated fur of a ur
general olive tint above, minutely punctulated with yellow. It ap
from Doyère, that the young has black bands across the shou
which are wanting in the adult. The ears are large; the polle
hallux are well developed; the tail is rather short, but bushy
feet are very slender; the tarsus and metatarsus are covered
short hair beneath. The length of the head and body is abou
that of the tail 17″·7. The nose and upper lip have a median g
beneath. The claws are elongated and Herpestiform (*cf.* fig.
p. 192).

There are two skins, several skulls, and one good skeleton i
British Museum; and there is a good skeleton in that of the C
of Surgeons.

The skull is remarkable for its extraordinary length and sle
ness. The shape of the auditory bulla is intermediate betwee
of the Herpestine and that of the Viverrine sections of the *Viver*
its most prominent portion is at its postero-external part; and
it inclines towards *Herpestes*. There is no pterygoid fossa.
opening of the external auditory meatus is generally rather
and more or less oval; it is the hinder portion of its margin
projects slightly the more. There is no fissure or foramen i
floor of the auditory meatus; nor is there a depression in the adj
part of the bulla as in *Galidia* and *Hemigalidia*. The anterio
of the bulla, however, is well marked off by a groove from th
terior part. There is no alisphenoid canal, nor any posto
processes. Cranial ridges are very faintly marked, save the
doidal ridge. The paroccipital is long, but does not depend.
mastoid is not more prominent than in *Genetta*. The conc
foramen is exposed. The carotid canal is as in *Herpestes*; an
artery enters the cranial cavity through a foramen or deep no
the sphenoid. The zygomata are very slender; and there is a
small glenoid cavity and postglenoid process. The palate is
little prolonged behind the last molars. There is a very conspi
and exceptional prominence in the middle occipital region to sl
the middle part of the cerebellum.

The dentition is especially remarkable for the small size o
canines, the canine-like character of the anterior premolars, the r
blance of the true molars to the premolars, and the wide diaste
between the three most anterior premolars both above and bel

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[1] P. Z. S. 1870, p. 824, pl. 51.

[2] Journal de Zoologie, vol. iii. (1874), p. 237.

tinæ; but is a character which is commonly present in the *Herpestinæ*. The remarkable os penis of *Cryptoprocta* is certainly a very distinctive character; but the generative apparatus of *Hyæna crocuta* is far more so, and no one would on that account raise that animal to the rank of even a subfamily. Moreover it is interesting to note that while the os penis is so small and so often absent in the *Viverrinæ*, "il n'en est pas de même dans les Mangoustes; il y est même assez développé"[1]—an assertion confirmed by the figures on De Blainville's plate 9: it is equally developed in *Herpestes paludinosus*. The claws are strongly arched (*cf.* fig. 14 F, p. 192).

As regards the teeth of *Cryptoprocta*, they are, as every one knows, extremely feline; but the longer I live, the more convinced am I that dental characters are valueless as indices of affinity, save as existing in closely allied forms—the different species of one genus. Amongst the *Viverridæ* we have seen how little the dental peculiarities of *Arctogale, Arctictis*, and *Cynogale* tell against the weight of other characters; the exceptional teeth of *Gulo*, amongst the *Mustelidæ*, teach the same lesson; and, as I shall shortly endeavour to point out, what I believe to be the affinities of *Proteles* to *Hyæna* and of *Hyæna* to *Herpestes* very strongly reinforce it.

Cryptoprocta, when first described (Trans. Zool. Soc. i. p. 137, plate 21), was ranked by Mr. Bennett, its describer, amongst the *Viverridæ*. De Blainville, in recognizing this affinity as especially justified by the milk-dentition, regarded it as especially allied to *Crossarchus*. He has figured the young skull and the milk-dentition[2].

The osteology of *Cryptoprocta* has been carefully described and figured by Alphonse Milne-Edwards and Alfred Grandidier in the Ann. des Sc. Nat. 1867, p. 314, pls. 7–10. The animal has also been described, and various details as to its habits given, by Messrs. Pollen and Van Dam in their 'Faune de Madagascar' (1868), p. 13.

Skeletons and two skins exist in the British Museum; and there is a skeleton in that of the Royal College of Surgeons. The length of the head and body of the largest specimen in the British Museum is about 81″·3, that of the tail 73″·7. The body is of one colour. The claws are sharp, very curved, and semicontractile; the tarsus and metatarsus is naked.

The skull has an auditory bulla, which is neither distinctly Herpestine nor Viverrine; it is more prominent than in *Paradoxurus*. The alisphenoid canal is constant[3]. The pterygoid fossa is very small. The external opening of the auditory meatus is rounded and of moderate size. The postorbital processes of the frontal are rather small, and very distant from the exceedingly small malar processes. The skull is but little pinched in behind the orbits. The condyloid foramen is more or less concealed. The cranial ridges are rather strongly developed. The paroccipital process is long, but not depending. The mastoid is well marked, and more developed than in the Civets. The carotid canal is as in *Herpestes*; and the artery enters the cranium by a well-marked foramen in the basis cranii. There is no foramen, fissure, or fossa on the floor of the auditory meatus. The palate is considerably prolonged behind the last molars. The angle of the mandible is rather short.

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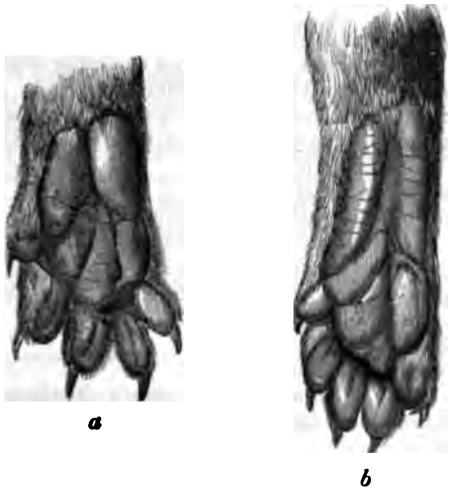
[1] De Blainville, 'Ostéographie,' *Viverra*, p. 39.

[2] Ostéog. Viverras, pls. 6 & 12.

[3] Present in all the specimens I have examined.

Fig. 15.



Soles of the paws of *Cryptoprocta* (after Alphonse Milne-Edwards).
a. Manus; *b.* Pes.

The teeth of *Cryptoprocta* are most feline. $\frac{\text{P. 4}}{}$ more resembles the corresponding tooth of *Felis* than of *Viverra*; but $\frac{\text{M. 1}}{}$ is elongated transversely as in *Hyæna striata*, and more so relatively than in the Cats. $\frac{\text{P. 3}}{}$ is cat-like, save that the talon is perhaps rather larger. $\frac{\text{P. 4}}{}$ is also very feline. $\frac{\text{P. 2}}{}$ is much larger than in the Cat, and two-rooted. There may be a small $\frac{\text{P. 1}}{}$. In the lower jaw $\frac{}{\text{M. 1}}$ is like the last, save that it has a talon. $\frac{}{\text{P. 4}}$ is like the Cat's; but its talon is a little larger. $\frac{}{\text{P. 3}}$ is larger relatively than in the Cat. $\frac{}{\text{P. 2}}$ has two roots.

In the milk-dentition, $\frac{\text{D. 4}}{}$ is very much larger relatively than is $\frac{\text{M. 1}}{}$. $\frac{\text{D. 3}}{}$ (as in the Cat) has its posterior cusp less developed than in the permanent upper sectorial, and its internal cusp more posterior. The lower deciduous sectorial $\frac{}{\text{D. 4}}$ has a smaller anterior cusp, and a more exterior talon than has the permanent sectorial. This is as in the Cat; though the difference as to the development of the talon between the deciduous and the permanent sectorial is less in *Cryptoprocta*.

The stomach[1] is much bent on itself, but has a considerable cardiac pouch. The small intestines are 4 feet 3 inches long; the large intestine is 5½ inches, and the cæcum 1⅛ inch. The latter narrows gradually to its extremity.

There is a very large supracondyloid foramen, and a very large bone to the penis.

The characters of the subfamily *Cryptoproctinæ* will then be as follows:—

(1) Claws very curved, sharp, and semiretractile.
(2) Postorbital processes long, but not enclosing orbits.
(3) Hinder chamber of bulla not distinctly everted.
(4) Hinder margin of auditory opening rather the more projecting.
(5) Floor of anterior part of bulla not fissured or pitted.
(6) Angle of mandible not everted.
(7) Mastoid rather prominent.
(8) Paroccipital processes not depending.
(9) Aperture of auditory meatus rounded, of moderate size.
(10) An alisphenoid canal.
(11) Carotid artery not perforating the basis cranii conspicuously.
(12) No prescrotal glands?
(13) Anus opening into a sac.
(14) One pair of anal glands?
(15) A very large supracondyloid foramen to humerus.
(16) Pollex and hallux both present.
(17) Cæcum moderate.
(18) Tarsus and metatarsus bald.
(19) Nose and upper lip medianly grooved.
(20) Dentition very feline, save that there is a double-rooted $\frac{}{\text{P. 1}}$.
(21) Tail long.
(22) Os penis very large.

With *Cryptoprocta* ends the list of genera which I am disposed to class in the family *Viverridæ*, following, as I do, Mr. Turner and Professor Flower in ranking the Hyænas as a group of proximately coordinate value with the Feline and Viverrine families.

Nevertheless I believe that the *Hyænidæ* are closely allied to the *Herpestinæ*—so much so that, had the Madagascar Viverrines [illegible]no existence, I should feel a certain temptation to exclude the Ichne[illegible]umons and their allies from the *Viverridæ*, and make of them a fa[illegible]ily *Herpestidæ*, under which the Hyænas could then be grouped. As it is, however, the plan I have adopted seems to me to be perh[illegible] best calculated to express the affinities of the existing *Æluroidea*[illegible]

The characters of the entire family *Viverridæ*, thus understo[illegible] may be expressed as follows:—

(1) There may or may not be a pollex; but in the large majority [illegible] species there is one.
(2) There may or may not be a hallux; but in the large majority [illegible] species there is one.
(3) The ungual phalanges may or may not be strongly arched; b[illegible]

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[1] Bennett, *l. c.* p. 139.

ɜ is not so wide a lamina of bone to shelter the base of
claw as in the *Felidæ*.

claws may be considerably arched, or they may be long
very slightly so. They are hardly ever (not except
aps in *Prionodon* and *Poiana*) completely retractile, and
ı are not at all so.

auditory bulla (except in *Nandinia*) is ossified, much in-
d, and shows externally that it consists of two chambers.

ulla is not more prominent towards its inner than towards
under border.

ɜ is an almost complete bony septum between the two
abers of the bulla, which may or may not be one behind
other.

bony meatus auditorius is almost always short, and may
ı its anterior, posterior, or inferior margin most project-
and it may be imperfectly ossified below.

ɛ is a carotid foramen, or two carotid foramina, visible on
side of the basis cranii.

e is (except often in *Viverricula*) an alisphenoid canal.

palatine foramina are situated in the anterior half of the
te.

ɜ generally and $\frac{}{\text{P. 2}}$ constantly developed.

e is always an $\frac{}{\text{M. 2}}$, and generally an $\frac{\text{M. 2}}{}$.

s always present, generally large.

antero-external cusp of $\frac{\text{P. 4}}{}$ is generally very small.

ıas almost always a considerable talon.

outer incisors may greatly exceed the middle ones in

humerus sometimes wants the supracondyloid foramen.

bone of the penis is small, save in *Cryptoprocta*.

ears are not very long, erect, and pointed.

tarsus and metatarsus are very often bald.

plantar pad (small or large), and one beneath each
t.

ɜ opening on the surface or in the middle of a saccular
ıneous invagination.

glands from one to five pairs; generally one pair.

often prescrotal scent-glands.

ım generally present and small or moderate, but occa-
ally absent.

ery hard, horny, sharp-pointed, conical papillæ on the
sum of the tongue.

ocampal gyrus completely separated from that anterior
rnal portion of the superior lateral gyrus which is behind
crucial sulcus, by the continuation forwards of the calloso-
ginal sulcus to join the crucial sulcus.

coronoid process of the mandible is almost, if not quite,
ays less lofty relatively, and less backwardly produced
n in the *Felidæ*.

(30) The proportional length of the limbs to the body is shorter than even in *F. eyra*.
(31) The muzzle is large in proportion to the cranium.
(32) The dentition may or may not be markedly sectorial.
(33) The tail is almost always long, but may be short (*Cynogale*); but it is never so rudimentary as in the Lynxes.
(34) Clitoris never traversed by urogenital canal.
(35) Dorsal vertebræ never more than fourteen.
(36) Postorbital processes generally developed, rarely enclosing orbit posteriorly.
(37) Paroccipital processes depending or not.
(38) Mastoid prominent or not.
(39) There may be a conspicuous carotid foramen (deeply notching the sphenoid) in the basis cranii, for the entrance of the carotid into the cranial cavity.
(40) Nose and upper lip generally medianly grooved, but not always so.
(41) Palate not much, moderately, or much prolonged behind molars.
(42) Pterygoid fossa present or absent.
(43) Size of species generally moderate or small, sometimes very small—the smallest of the Æluroidea.

The Hyænas form three well-marked species, whereof one (*crocuta*) is so much more distinct from its geographical ally (*H. brunnea*) than is the latter from the third form, *H. striata*, that I think it should rank as a distinct genus. *H. striata* is found in India, Persia, Asia Minor, and North Africa. The other two Hyænas are South-African only.

The anatomy of the genus (besides the notices in Cuvier and Meckel) has been given in part by Hunter ('Essays and Observations,' vol. ii. p. 57), by Cuvier and Daubenton (Hist. Nat. ix. p. 268, pls. 25–30), by Dr. Murie (Trans. Zool. Soc. vol. vii. p. 503, pl. 63), and by Dr. Watson (P. Z. S. 1877, p. 369, pls. 40 & 41; P. Z. S. 1878, p. 416, pls. 24 & 25; and P. Z. S. 1879, p. 79, pls. 5 & 6).

In *Hyæna* the muzzle is medianly grooved beneath. The hair is harsh and long, and forms a sort of mane along the middle of the back. There are but five digits either in front or behind. The legs are rather long, behind as well as in front. The tarsus and metatarsus are both hairy. Each foot has a single palmar or plantar naked pad, and one such pad to each toe. The claws are blunt and non-retractile, rather long, but not as we find them in the *Herpestidæ*. The body is either greyish or brownish, with blackish bands extending vertically on each side of the body and horizontally on the limbs, or is more or less uniformly brownish. The ears are erect and very long and pointed, such as exist in none of the *Felidæ* or *Viverridæ*. There is an anal pouch, with two (*H. striata*) or three[1] (*H. brunnea*) pairs of anal glands on each side of the rectum; and in one, if not

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[1] Dr. Murie, *l. c.* p. 506.

h species, there is a transverse band of isolated follicles at the
n of the anal pouch.

e penis is long and pendulous, and entirely devoid of any bone.

ere are fifteen dorsal vertebræ.

e cranium of *Hyæna* differs from every Viverrine cranium by its
ious sagittal and lambdoidal ridges, and strong and greatly
d zygomata. The general type of its construction is Viverrine,
h there is no alisphenoid canal or septum between the anterior
osterior portions of the auditory bulla. As to the first point,
ve seen that the canal is generally wanting in *Viverricula*, and
antly so in the *Galidictinæ* and *Eupleres*. As to the auditory
it is interesting to note that the aperture between the chambers
arged in the *Herpestinæ* (which by their circumanal pouch
ble the *Hyænidæ*); and though there is no septum, yet I have
ed in both species of *Hyæna*, inside the auditory bulla, two
ns ridges or laminæ, which if further developed would divide off
ll anterior chamber from the much larger and externally more
inent posterior portion. The anterior portion of the margin of
ternal opening of the auditory meatus (which has no fissure or
en in its floor) is much more produced than any other part—an
eration of a character we have already seen in the *Herpestinæ*.
e is no pterygoid fossa. The postorbital processes are short and
, and widely separated from the malar processes. The skull
t pinched in behind them. The condyloid foramen is concealed.
paroccipital is long and depending. The mastoid is rather
inent. The carotid canal is much more Viverrine than Feline:
sterior opening is always larger, and generally situated much
anteriorly than in the *Felidæ*, and more approaching its situa-
in the *Viverrinæ*. There is no carotid foramen in the sphe-
; but it enters the cranium (beside the hinder end of the *sella*
a) through the foramen lacerum, and covered in by the auditory
. The palate is much prolonged behind the last molars. The
r border of the mandible is much curved; the angle is flattened
g its inferior border, and is pressed up nearer to the condyle
in *Felis* or in any other Æluroid I have seen—*Nandinia* (which
has rather strongly developed cranial ridges) being most like it
is respect, except, of course, *Crocuta* and *Proteles*.

he teeth of *Hyæna*[1] are so well known that I hesitate to re-
ribe them; but I feel any utility this paper may possess would
reatly impaired if their resemblances and differences to other
roids, and especially to the Cats, were not shortly noted in it.

he outer upper incisors are canine-like, and much more preponde-
over the inner ones than in the Cats. The canines, on the other
l (both above and below), are relatively shorter, more flattened
nally, and without longitudinal grooves either outside or inside.
is relatively larger than in *Felis* (though I have observed it to be

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[1] igured by De Blainville (Hyènes, pl. vi.) and Cuvier (Dents des Mamm.
). For osteology, see Cuvier's 'Ossemens Fossiles,' 4th edition (1835),
ii. p. 311, and Atlas, vol. ii. pl. 190.

wanting in a specimen of *H. brunnea*). P. 4 is like the Cats'
that the anterior and posterior external cusps are nearly equa
more nearly approach in size the median external cusp, th
internal cusp is much larger and stouter, while the base c
antero-external angle of the tooth is not prominent. The a
external fang is much more slender relatively, while the po
external one and that of the internal tubercle are stouter.
differs from that of the Cats in its greater relative vertical an
antero-posterior development, and that its small talon seems
to be bilobed. Its basal ridge is much more developed withi
still more at the hinder part of the tooth. It has two very long
the anterior one of which is slightly the stouter. $\underline{P.\,2}$ differs
that of *Felis* (except that of *F. planiceps*) in having two roo
is like $\underline{P.\,3}$, only smaller and less powerful. It is vastly more p
ful than is $\underline{P.\,2}$ of *Felis*. $\underline{P.\,1}$ is close to (or almost close to
canine; it is conical, with a basal ridge all round (much m
within and behind), and has a cutting-edge extending from the
rior outer to the antero-inner parts of the tooth. $\overline{P.\,1}$ is al
$\overline{P.\,2}$ is much larger than $\underline{P.\,1}$, but smaller than $\underline{P.\,2}$; it is conica
laterally compressed, with an antero-posterior cutting-edge,
basal ridge all round it, but especially behind, where it devel
second, small tubercle. It is like the Cats' $\overline{P.\,2}$, but it is a
more vertically developed relatively, and is more quadrate
viewed from above. It has two subequal fangs. $\overline{P.\,3}$ is more c
form; it differs from the Cats' in its large basal ridge, and ha
large roots, the anterior of which is rather the larger. $\overline{P.\,4}$ ha
fangs, the posterior of which is rather the larger; it is lik
last tooth, save that its talon is larger and bears two tubercle
by side. It differs from the Cats' in its smaller talon and n
rudimentary anterior cusp. $\overline{M.\,1}$ is like that of the Cats; bu
cusps are relatively shorter, and there is a talon which bea
small cusps; there is also a cusp within the more posterior o
two large cusps.

Comparing the milk-dentition of *Hyæna* with that of the C
find that $\underline{D.\,2}$ has two roots; it is very like the Cats' $\underline{P.\,3}$, and t
fore very unlike $\underline{D.\,2}$ of *Felis*. $\underline{D.\,3}$ (the milk sectorial) is ver
the Cats' deciduous sectorial; but its inner tubercle is larger
tively; it is similarly situated. The deciduous outer incisors d
exceed the inner ones nearly so much as in the permanent den
$\overline{D.\,2}$ is just like the Cats' $\overline{D.\,3}$. $\overline{D.\,3}$ is like the Cats' $\overline{D.\,3}$, only l
relatively. $\underline{D.\,4}$ is very different from that of the Cats, because
a very large talon with three small cusps as well, on and inside
side by side with) the hinder principal cusp, half the size o
latter; it is a slight exaggeration of the permanent lower secto

There is no supracondyloid foramen to the humerus. Th only a rudimentary metacarpal or metatarsal bone for either pollex or hallux.

The genus *Crocuta*, instituted by Gray[1] for the Spotted Hyæna of South Africa, differs from the two species of true Hyænas as to coloration, and in that its ears are not so elongated and are rounded instead of pointed. The hind legs are shorter than the fore limbs; there is no dorsal mane; and there is but a single pair of anal glands, one on each side of the rectum, and a transverse band of follicles. The clitoris is enormous, and perforated by the urogenital canal[2], as has been excellently described in our 'Proceedings' by Dr. Watson[3].

The cranium of *Crocuta* is like that of *Hyæna*, but that the incipient division between the two parts of the auditory bulla is more rudimentary. As to the dentition[4], $\frac{\text{M.1}}{}$ has a quite minute rounded crown. $\frac{\text{P.4}}{}$ has antero-external cusp much smaller than the two other external cusps; $\frac{\text{P.3}}{}$ is very long, as is also $\frac{}{\text{P.3}}$; $\frac{}{\text{P.4}}$ has not two subequal tubercles side by side on its talon, there being the merest rudiment of the inner tubercle. $\frac{}{\text{M.1}}$ has no cusp inside the more posterior of its two large cusps; and its talon is quite minute.

The penis is large and pendulous, and boneless.

The dorsal vertebræ are fifteen in number.

The characters presented by the group of Hyænas—the subfamily *Hyæninæ*—are as follows:—

(1) There is no pollex.
(2) There is no hallux.
(3) The ungual phalanges are not strongly arched.
(4) The claws are but slightly arched, blunt, and not retractile.
(5) The auditory bulla is inflated, and shows no external evidence of division.
(6) The bulla is most prominent posteriorly, where it is not everted.
(7) Only a rudiment of a bony septum.
(8) The bony meatus auditorius is short; but its anterior lip is produced.
(9) There is a carotid foramen not situated quite so far forward as in the *Viverridæ*.
(10) There is no alisphenoid canal.
(11) The palatine foramina are situated on the anterior half of the palate.
(12) $\frac{\text{P.1}}{}$ and $\frac{}{\text{P.2}}$ are developed.
(13) There is no $\frac{\text{M.2}}{}$ or $\frac{\text{M.3}}{}$.

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[1] P. Z. S. 1868, p. 525.

[2] It may be interesting to note that, in the 'Journal of Anatomy and Physiology,' vol. xiv. (1879), p. 95, there is recorded (in a paper on the homology of the sexual organs) the case of a woman formed in the same way as is the female *Crocuta*.

[3] P. Z. S. 1878, p. 416.

[4] Figured by De Blainville; Cuvier, Ossem. Foss. ii. pl. 190; Gervais, Mamm. p. 97.

(14) $\frac{\text{M. 1}}{\quad}$ is small and minute, occasionally absent.
(15) The anterior and posterior external cusps of $\frac{\text{P. 4}}{\quad}$ are about equal, and nearly approach in size the median external one.
(16) $\frac{\quad}{\text{M. 1}}$ has a large or small talon.
(17) The outer incisors greatly exceed the middle ones.
(18) The humerus wants the supracondyloid foramen.
(19) The penis is boneless.
(20) The ears are long, erect, and (with one exception) pointed.
(21) The tarsus and metatarsus are entirely hairy.
(22) There is one small plantar pad and one beneath each digit.
(23) The anus opens into a sac.
(24) The anal glands vary from one to three pairs.
(25) There are no prescrotal scent-glands.
(26) There is a moderate cæcum.
(27) The tongue is furnished with large conical papillæ on its dorsum; but these are not hard as in the *Felidæ*.
(28) The calloso-marginal sulcus joins the crucial sulcus.
(29) Angle of mandible flattened along its inferior border, and pressed up nearer to the condyle, relatively, than in the *Felidæ*.
(30) Proportional length of limbs longer than in *Viverridæ*.
(31) Length of muzzle to cranium intermediate between *Viverridæ* and *Felidæ*.
(32) Dentition extremely sectorial, while it is nevertheless formed for crushing.
(33) Tail rather shorter, but not as in Lynxes.
(34) The clitoris may be traversed by the urogenital canal.
(35) Dorsal vertebræ not less than fifteen.
(36) Postorbital processes short and blunt.
(37) Paroccipital processes depending.
(38) Mastoid rather prominent.
(39) No carotid foramen in sphenoid.
(40) Nose and upper lip medianly grooved.
(41) Palate not much prolonged behind last molar.
(42) No pterygoid fossa.
(43) Enormous cranial ridges.

The genus *Proteles*, long known[1] as regards its skin and skeleton, had its anatomy first fully described by Professor Flower[2], who pointed out previously[3] the characters of the basis cranii, and its affinity, thus indicated, to the *Herpestinæ* and the *Hyæninæ*. Save for its greater slenderness, the animal has the general form of an Hyæna, with similarly long, erect, and pointed ears, and with a well-developed dorsal mane. There are five fore digits (though the pollex is short), but only four digits to the hind foot. There is a single palmar or plantar pad, and one pad for each toe; and the tarsus and metatarsus are hairy. The nose is medianly grooved beneath. The fur is woolly, of a yellowish or reddish brown, with a few vertical black bands on the sides of the body, and others, more or less horizontal, on the limbs. The claws are blunt, non-retractile, and rather long. There is an anal pouch with one pair of anal glands, and a supraanal band of follicles, as in *Crocuta*. The penis is boneless; and there are fifteen dorsal vertebræ.

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[1] First described in Sparrman's 'Voyage to the Cape of Good Hope, 1772-1776.' See P. Z. S. 1869, p. 475.

[2] P. Z. S. 1869, p. 474, pl. 36, with various anatomical woodcuts.

[3] P. Z. S. 1869, p. 28.

As to the skull, its auditory bulla is (as Prof. Flower has pointed out) large, pyriform, and everted posteriorly as in *Herpestes*, divided by a septum into two chambers, one in front of the other. The margin of the external opening of the auditory meatus (which has no fissure or foramen in its floor) is most prominent anteriorly. There is no alisphenoid canal; the carotid canal is as in *Hyæna*; the paroccipital process is flattened, and does not depend; the mastoid is rather strongly prominent; the postorbital processes of the frontal are pointed and well developed; the skull is not pinched in behind them; the malar processes are moderately developed; the cranial ridges are weak; but the zygoma is rather strongly arched outwards; the condyloid foramen is concealed; the palate is very wide, and is considerably prolonged; and the pterygoid bones come very near the bullæ; the mesopterygoid fossa is very wide. The angle of the mandible is singularly flattened behind; and its apex is produced directly backwards. The hinder part of the horizontal ramus is bent up as in *Hyæna*.

The teeth, as is universally known, are quite abnormal and rudimentary. There are only three small, conical, blunt upper molars, whereof only $\frac{\text{P. 3}}{}$ is two-rooted. There are only two lower molars, whereof only the hinder one is two-rooted.

Proteles agrees with the Hyænas in the characters just enumerated except Nos. 1, 5, 6, 7, 13, 15, 16, 17, 31, 32, 34, 36, 37, 41, and 43.

These characters, then, serve to differentiate the *Protelinæ* from the *Hyæninæ*.

The characters common to the whole family *Hyænidæ* will then stand as follows:—

(1) There may or may not be a pollex; but in the majority of species there is not one.
(2) There is never a hallux.
(3) The ungual phalanges are never strongly arched; nor is there a wide lamina to shelter the base of the claw.
(4) The claws are never more than slightly arched; they are blunt and non-retractile.
(5) The auditory bulla is inflated, but generally gives no external indication of division.
(6) The bulla entirely ankylosed into one mass, and is not more prominent towards its inner than towards its hinder border.
(7) There is generally only a rudiment of a septum within the bulla.
(8) The bony meatus auditorius is shorter, and has the anterior

part of its margin prolonged, but is never imperfectly ossified below.

(9) A carotid foramen is visible on the inner side of the bulla, but is placed more posteriorly than in the *Viverridæ*.

(10) There is no alisphenoid canal.

(11) The palatine foramina are situated in the anterior half of the palate.

(12) $\frac{\text{P. 1}}{}$ and $\frac{}{\text{P. 2}}$ are developed.

(13) There is never either $\frac{\text{M. 2}}{}$ or $\frac{}{\text{M. 2}}$.

(14) $\frac{\text{M. 1}}{}$ is absent or small.

(15) $\frac{\text{P. 4}}{}$ may abort; but if present, it has its anterior and posterior external cusps about equal and nearly approaching the median external cusp in size.

(16) $\frac{}{\text{M. 1}}$ has a large or small talon, or is absent.

(17) The outer incisors generally exceed greatly the inner ones, and are caniniform.

(18) The humerus wants the supracondyloid processes.

(19) The penis is boneless.

(20) The ears are long, erect, and generally pointed.

(21) The tarsus and metatarsus are entirely hairy.

(22) There is one small plantar pad with four small pads for the digits of the pes.

(23) The anus opens into a sac.

(24) The anal glands vary from one to three pairs.

(25) There are no prescrotal scent-glands.

(26) There is a moderate cæcum.

(27) The tongue is furnished with much-enlarged conical papillæ on its dorsum; but they are not placed as in the *Felidæ*.

(28) The calloso-marginal sulcus joins the crucial sulcus.

(29) The angle of the mandible is much flattened beneath.

(30) Proportional length of the limbs larger than in the *Viverridæ*.

(31) Length of muzzle to cranium generally intermediate between the conditions presented by the *Felidæ* and the *Viverridæ*.

(32) Dentition extremely sectorial, and yet formed for crushing, or else altogether rudimentary.

(33) Tail rather short, but not as in the Lynxes.

(34) The clitoris may be traversed by the urogenital canal.

(35) Dorsal vertebræ never less than fifteen.

(36) Postorbital processes short and blunt or moderate; but orbits never enclosed by bone.

(37) Paroccipital processes generally depending, but not always.

(38) Mastoid rather prominent.

(39) No carotid foramen in sphenoid.

(40) Nose and upper lip medianly grooved.

(41) Palate may or may not be much prolonged beyond the molars.

(42) No pterygoid fossa.

(43) Size of species always large.

The following tabular arrangement may be convenient for reference :—

UROIDEA: *with*	no $\frac{}{\text{P. 2}}$; no alisphenoid canal; bulla not externally constricted, but internally divided; metatarsus entirely hairy; and 13 dorsal vertebræ.	FELIDÆ.	Claws completely retractile; inner cusp of upper sectorial moderate.	*Felis.*
			Claws incompletely retractile; inner cusp of upper sectorial rudimentary.	*Cynælurus.*
	a $\frac{}{\text{P. 2}}$; generally an alisphenoid canal; bulla externally constricted, and internally divided; metatarsus hairy or naked; and 13 or 14 dorsal vertebræ.	VIVERRIDÆ.		
	a $\frac{}{\text{P. 2}}$; no alisphenoid canal; bulla divided and constricted, or not so; metatarsus hairy; 15 dorsal vertebræ.	HYÆNIDÆ.		

æ =	almost always an alisphenoid canal and supracondyloid foramen; claws strongly curved and more or less retractile; bulla not posteriorly everted; large canines; generally prescrotal glands, and anus not opening into a sac.	VIVERRINÆ.
	No alisphenoid canal or supracondyloid foramen; claws moderately curved, not retractile; bulla posteriorly everted; large canines; no prescrotal glands; anus not opening into a sac.	GALIDICTINÆ.
	no alisphenoid canal; a supracondyloid foramen; claws elongated, not retractile; bulla hardly everted posteriorly; very small canines; no prescrotal glands; anus ?	EUPLERINÆ.
	an alisphenoid canal; a large supracondyloid foramen; claws very curved and retractile; bulla not distinctly everted; large canines; no prescrotal glands; anus opening into a sac.	CRYPTOPROCTINÆ.
	an alisphenoid canal; a supracondyloid foramen; claws elongated, not retractile; bulla distinctly everted; large canines; no prescrotal glands; anus opening into a sac.	HERPESTINÆ.

VIVERRINÆ.

Upper lip medianly grooved, tail long.

I. Tarsus and metatarsus entirely hairy; ears never tufted. $\frac{\text{M. 2}}{}$ present .... *Viverra.*

$\frac{\text{M. 2}}{}$ absent .... *Prionodon.*

II. Not so; ears rarely tufted.
  α. A bald line on tarsus. $\frac{\text{M. 2}}{}$ present...... *Genetta.*
    $\frac{\text{M. 2}}{}$ absent...... *Poiana.*
  β. Two bald spots on tarsus .... *Fossa.*
  γ. Tarsus half bald; auditory bulla only partly ossified .... *Nandinia.*
  δ. Tarsus half bald; auditory bulla entirely ossified ....
    1. Back marked with transverse bands .. *Hemigalea.*
    2. Not marked with transverse bands.
      a. Teeth small; hinder part of alveolar border of mandible everted ...... *Arctogale.*
      b. Teeth not small; hinder part of alveolar border not everted ...... *Paradoxurus.*
  ε. Tarsus absolutely naked; ears tufted .. *Arctictis.*
B. Upper lip not medianly grooved; tail short .. *Cynogale.*

Herpestinæ.

A. Toes 5—5.
  I. A groove beneath nose.
    α. Pm. $\frac{4}{4}$ .... *Herpestes.*
    β. Pm. $\frac{3}{3}$ .... *Helogale.*
  II. No groove beneath nose.
    α. Tarsus hairy .... *Rhinogale.*
    β. Tarsus bald .... *Crossarchus.*
B. Toes 5—4.............................. *Cynictis.*
C. Toes 4—4.
    α. A groove beneath nose .... *Bdeogale.*
    β. No groove beneath nose .... *Suricata.*

Galidictinæ.

A. Inferior canine very large .... *Galidictis.*
B. Inferior canine not very large.
  I. $\frac{\text{P. 1}}{}$ absent; $\frac{\text{M. 2}}{}$ very small .... *Galidia.*
  II. $\frac{\text{P. 1}}{}$ present; $\frac{\text{M. 2}}{}$ of moderate size .... *Hemigalidia.*

Distribution of the Æluroidea.

The suborder extends (apart from the arctic and antarctic regions) over the whole world except Australia, New Guinea, New Zealand, Polynesia, and the Antilles—extending even into the Moluccas, Philippines, Celebes, and Madagascar.

The family *Felidæ* is almost as cosmopolitan as is the entire suborder, but it is not found in the Moluccas, Philippines, Celebes, or Madagascar. It alone of the Æluroidea extends into the New World; but, as was long ago remarked by Buffon, the Cats of the Old and New Worlds are markedly distinct. Only one species, the northern Lynx, is common to both worlds.

The Asiatic and African Cats are distinct, except the Lion, Leopard, Caracal, and Chetah. Twenty-six species seem to be peculiar to Asia, and only six to Africa. Ten species are peculiar to America.

The Indian archipelago is very rich in species; and the island of Bali seems their extreme limit. The Tiger is found there. Two species of Lynx and the Wild Cat are European.

The *Hyænidæ* are almost entirely African, and three of its five species South-African. *H. striata* alone extends into Western Asia and Northern Africa.

The family *Viverridæ* is exclusively confined to the Old World, and has but two representatives—a Genet and an Ichneumon (*Genetta vulgaris* and *Herpestes ichneumon*)—in Europe.

Apart from the Ichneumons and Paradoxures, twelve species are Asiatic and twenty African. The Ichneumons are divided, as beforesaid, into thirteen Asiatic and seven African. The Paradoxures are all Asiatic, but are not well defined as to species; if we accept provisionally the number (twelve) of Dr. Gray [1], that will give a total of thirty-seven Asiatic forms of *Viverridæ*, and thirty-two African forms. Besides these, eight species are found in Madagascar.

No species is common to Asia and the continent of Africa, except *Genetta vulgaris* and *Herpestes ichneumon*.

No species appears to be common to Madagascar and the continent of Africa, a species of *Crossarchus* found there having been probably introduced by man.

No species is common to Madagascar and Asia except *Viverricula*, that wandering Jew amongst the *Viverridæ*, the extensive range of which has been already indicated [2].

The other Madagascar species are *Fossa*, *Eupleres*, and the four species of *Galidictinæ* and *Cryptoprocta*.

Thus Madagascar, containing as it does examples of all five subfamilies of *Viverridæ*, has by far the most peculiar Viverrine fauna of the whole world.

Next to it comes Borneo, with its *Prionodon*, *Arctictis*, *Cynogale*, *Hemigalea*, *Parodoxuri*, and *Herpestes*; and the Indian Archipelago generally is rich in Viverrine life as well as being inhabited by the Cats *F. macrocelis*, *F. marmoratus*, *F. planiceps*, and *F. badia*.

The Viverrine section of the subfamily *Viverrinæ* are pretty equally divided between Asia and Africa; with the exception of the West-African *Nandinia*, the paradoxurine section of the *Viverrinæ* are entirely Asiatic.

As a rule the *Viverrinæ* as to species are predominantly Asiatic, while the *Herpestinæ* are predominantly African, and especially South-African, As regards genera, the *Viverrinæ* have six genera peculiar to Africa, and one to Madagascar, while three (*Viverra*, *Viverricula*, and *Genetta*) are common to both the continents.

As regards genera, the subfamily *Herpestinæ* has no less than six peculiar to Africa, and not one Asiatic genus which is not also found in Africa, the only genus common to the two continents being *Herpestes*.

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[1] Cat. of Carnivora in Brit. Mus., p. 63.

[2] See *ante*, p. 149.

It is interesting to note that the genera of *Viverridæ* with numerous anal glands and a large circumanal pouch are African, and especially South-African, like *Hyæna brunnea*.

The extreme geographical limits of the *Viverridæ* seem to be France, Spain, Shanghai, Formosa, the Philippines, Celebes, Lombock, Madagascar, the Cape, and the north-western part of Africa—Cape Verd.

The most northern range in the continent of Asia appears to be that of *Hyæna striata* in Asia Minor[1].

No species of the *Viverridæ* is so widely diffused as is *Viverricula*.

Geographically, then, as well as in some respects structurally, the *Viverridæ* (apart from the Madagascar forms) seem to divide themselves into two great sections—one Asiatic and Viverrine, the other African and Herpestine.

The Æluroidea being considered as one whole, and Dr. Gray's twelve species of *Paradoxurus* and my enumeration of Cats being provisionally accepted, we have a total of 5 species of Æluroids in Europe, 7 species in Madagascar, 11 species in America (all Cats), 46 species in Africa, and 68 in Asia, 7 of these being common to both Africa and Asia.

Before long I hope to lay before the Society my notes on some parts of the anatomy, and especially on the osteology of the Æluroidea.

2. On some Points in the Anatomy of the Indian Darter (*Plotus melanogaster*), and on the Mechanism of the Neck in the Darters (*Plotus*), in connexion with their Habits. By W. A. Forbes, B.A., Prosector to the Society.

[Received January 9, 1882.]

It is to the late Prof. Garrod that we are indebted for our knowledge of the great differences in the anatomy of the digestive organs of the American[2] (*Plotus anhinga*), and African[3] (*P. levaillanti*) Darters. The existence of such differences in birds apparently so nearly allied made it very desirable to obtain a knowledge of these parts in the other species of the genus *Plotus*.

On April 8th last, the Society obtained, by exchange from the Zoological Gardens of Calcutta, the first specimen of the Indian Darter (*Plotus melanogaster*) that it has acquired. The specimen, a

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[1] P. de Tchihatcheff in his 'Asie Mineure' (1866), 2e partie, p. 682, reports good evidence of its existence in Asia Minor. He says,—"Je ne l'ai jamais observée à l'état vivant, mais dans plusieurs localités de la Phrygie, de la Mysie et du Pont, les habitants m'en ont positivement constaté l'existence; d'ailleurs à Selevké (littoral de la Cilicie pétrée), une dépouille de la Hyæna striata me fut montrée par un chasseur Arménien qui m'assura d'avoir tué l'animal dans les montagnes voisines."

[2] P. Z. S. 1876, pp. 335–345; Scient. Papers, pp. 334–346, pls. xviii.–xx.

[3] L. c. 1878, pp. 679–681; l. c. pp. 346–348.

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On April 8th last, the Society obtained, by exchange from the Zoological Gardens of Calcutta, the first specimen of the Indian Darter (*Plotus melanogaster*) that it has acquired. The specimen, a male, lived in excellent health till December 21st last, when it died suddenly, its death apparently having been caused by some sudden shock produced by too rapid feeding, as a dozen small fishes, just swallowed, were found in its stomach. No disease whatever could be found. It is this specimen that forms the subject of the present communication.

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[3] *L. c.* 1878, pp. 679–681; *t. c.* pp. 346–349.

As regards its stomach, *Plotus melanogaster* closely approaches *P. levaillanti*, the proventriculus being in the form of two quite separate patches, and the pyloric lobe being provided with a similar hair-covered conical and retractile "plug." In *P. anhinga*, it will be remembered, the proventricular glands are collected together into a special diverticulum of the stomach, whilst the pyloric lobe, though hairy internally, has no such plug. In *P. melanogaster* the two gland-patches have the form of watch-pockets, which nearly, though not quite, unite with each other superiorly. They measure 1·1 inch transversely and ·8 inch from above downwards, being thus a little larger than the similarly shaped and situated ones of *P. levaillanti*[1]. There is no trace of the elevated "U-shaped ridge" situated on the anterior wall of the stomach between the two patches, described and figured by Prof. Garrod in the last-named species. The gland-patches are covered, as is the rest of the interior of the stomach, by the usual yellow wrinkled "epithelium." This ceases abruptly above at the level of the upper margins of the glandular areas, where it meets the smooth and pink mucous membrane of the œsophagus. Along this line of junction, the epithelial coat is thicker and jagged, an appearance probably due to several thicknesses of this coat having been "moulted" (as we know happens in the American species) and not come clean away[2].

The second, or pyloric, stomach is quite as distinct in *Plotus melanogaster* as it is in the two other species of the genus dissected. Like these, too, its pyloric half is covered internally with the peculiar hairy mat already described in these birds: the cardiac part, on the other hand, is covered by a yellow "epithelium" continuous with that of the rest of the stomach. The hairy covering forms a complete ring, thickest and best developed inferiorly—on the surface corresponding to the "greater curvature" of the Mammalian stomach—and quite surrounding the equally hairy pyloric plug. This "plug" is not a free process: it is rather a well-defined ridge, nearly cylindrical in section, attached superiorly to the wall of the stomach, but ending freely below. It, particularly towards its termination, is thickly covered with hairs of a similar character to those in the rest of the hairy region. When fully retracted, it completely fills up the centre of the hairy ring already described, the communication of the cavities of the stomach and duodenum being reduced to a narrow aperture situated below the plug, and only capable of allowing the passage of a bristle.

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[1] In the proventricular glands being limited to distinct areas, which do not unite to form a zone, *Plotus levaillanti* and *P. melanogaster* resemble the genus *Phalacrocorax*.

[2] Cf. Bartlett, P. Z. S. 1881, p. 247.

no further flexion is possible. The 8th vertebra is thus so articulated with the 7th anteriorly and the 9th posteriorly as to allow it, when the neck is flexed, to be nearly at right angles to the rest of the neck, the two portions of which, though parallel, are then at different horizons, something like the two bars of a parallel ruler (*vide* diagram, p. 211, fig. 1). When the neck is bent in this Z-shaped form, any opening out of the anterior angular bend by the action of the anterior neck-muscles causes the anterior moiety of the neck to suddenly shoot out, thus causing a corresponding protrusion of the head and beak (diagram, fig. 2). By the flexion of the 6th on the 7th, and of the 9th on the 10th, cervical vertebræ, the curve of the neck is increased—the articulations of the 8th vertebra still forming the double hinge round which motion takes place—and the impaling action correspondingly augmented. This protrusion, though only for a short distance, is so violent as to effectually "strike" the fish which the bird is pursuing.

The bending-back of the neck is effected, partly by the action of the *longus colli posterior*, partly by a special pair of closely approximated muscles, situated anteriorly along the middle line of the neck, which arise close together from the hæmapophysial spine of the 11th cervical vertebra, near its anterior articular end, and are inserted into the sides of the anterior half of the 6th cervical.

The opening-out, on the other hand, of the genu formed by the 7th and 8th cervicals—by which, as already described, the impaling action is produced—is caused by the contraction of the thoracically very powerful *longus colli anterior*. The main tendon of this is inserted on the long, backwardly-directed hæmapophysis of the 8th cervical, playing round the doubly-grooved surface of the inferior arch formed by the hæmapophyses of the 9th cervical, to which vertebra, as well as to the 10th, it gives off much smaller tendinous slips.

It is obvious that considerable advantage is gained by the action in question, the rapid protrusion of the narrow neck and head over a small space by this mechanism necessitating a less amount of exertion than would a similar movement of the whole bird over the same space, and being equally efficacious in striking the prey. The whole mechanism, it may be observed, exists in a less developed form in the neck of the Herons, Cormorants, &c.; and it requires but a slight modification of the arrangement of these parts in those birds—none of which, so far as I know, impale their prey like the Darters—to bring about the perfect adaptation of these structures to a newly acquired mode of feeding.

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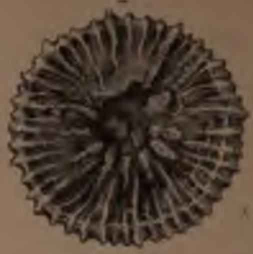

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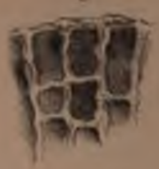

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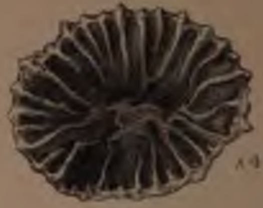

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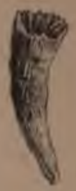

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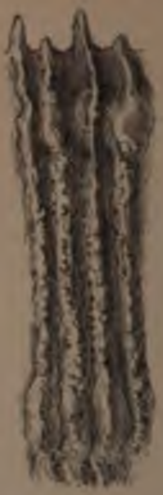

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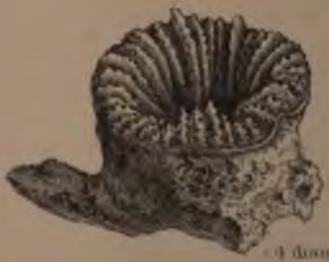

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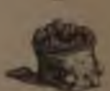

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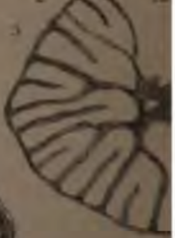

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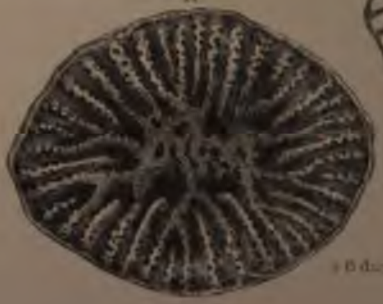

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NEW CORALS FROM MA[illegible]A

3. On some Recent Corals from Madeira. By Prof. P. MARTIN DUNCAN, M.B. (Lond.), F.R.S., Pres. Royal Micros. Soc., &c. (Communicated by the Secretary.)

[Received January 19, 1882.]

(Plate VIII.)

In the autumn of 1881, Mr. J. Y. Johnson, of Madeira, sent me a small collection of Corals which he had obtained, from a few fathoms depth, in the sea off Funchal and other places near the island. Some of the specimens were adherent by their bases to a small species of oyster, and others to the bases of Gorgonidæ. As the collection has species in it representing the Mediterranean, Floridan, and North-Atlantic deep-sea coral-faunas, I thought that its description would be of some importance. The new species are three in number; and two of them are very interesting. One, *Ceratotrochus johnsoni*, belongs to a genus which has a recent species on the American side of the Atlantic and fossil forms in the Mediterranean Pliocene and Miocene and in the Australian Miocene strata. Another, *Caryophyllia endothecata*, reveals a decided interseptal structure like the endotheca of the family Astræidæ.

Description of the Species, and Remarks.

MADREPORARIA.

Section *APOROSA*.

Family TURBINOLIIDÆ.

Subfamily *Caryophyllinæ*.

Genus CARYOPHYLLIA, Milne-Edwards & Haime.

This genus and its divisions were noticed at some length in the description of the Madreporaria dredged up during the expedition of H.M.S. 'Porcupine,' published in the 'Transactions' of the Society, vol. viii. pt. v. 1873. It is not necessary, therefore, to recapitulate, and especially as there has been no increase of knowledge on the subject of any importance since that date.

There are some fine specimens from Madeira of a species of *Caryo-*
a which was not obtained during the 'Porcupine' expedition,
hich is a very well-known Mediterranean form. The specimens
up in deep water off Madeira, attached to a valve of *Ostrea*
a, which, in its turn, rested upon a hexactinellid sponge.
pecimen was mature; a second was smaller; and there were two
mall individuals. The larger specimen has the parts above the
perfect; but *Cliona*-borings have destroyed the broad base of
ment.

Caryophylliæ with more than four perfect cycles of septa

CARYOPHYLLIA CYATHUS, Lamarck, Syst. des Anim. sans v
1801.

The corallum is tall, slightly bent, subturbinate, slightly
pressed, and has a base much narrower than the calicular op
The costæ are only distinct for a short distance from the calic
then they become flat and only occasionally visible, being sep
by indistinct lines and ornamented by numerous small gr
which are placed across the costæ. The whole surface is, as it
shining and varnished-looking; near the base the costæ a
visible, but the granulations and varnished appearance prevail.

The calice is longer than broad, elliptical in outline, very
centrally and shallow at the margins. Some of the sept
slightly exsert, but they do not project much higher than the o
and this is the case with the primaries and other large septa v
have no pali before them. The septa are close, stout, and une
and there is but little space between them; they are round
their upper edge and towards the columella; they are straighte
some are rather large internally. There are many septa of the
cycle.

The columella is deeply sunken, fasciculate, elliptical in out
rounded above, and composed of eleven processes well separa
The pali are higher than the columella, stout, and as large as
ends of the septa to which they belong, and from which they
well separated above. There are eighteen of them; and they
separated by a space from the columella.

The height of the coral is $1\frac{1}{10}$ inch, and the length of the ca
$\frac{4}{5}$ inch, its breadth being $\frac{5}{10}$ inch.

This description corresponds specifically with that of MM. Mil
Edwards and Jules Haime in their Hist. Nat. des Corall. vol.
p. 13. The columella, however, has fewer processes; but it is fou
that there is much variation in that structure in specimens fr
the Mediterranean, some of which have the same number as
Madeiran form.

A smaller specimen has a widely open calice, the columella dee
seated, and the septa barely exsert. The columella is made up
about five twisted processes. The pali are thin, separate, and eight
in number; they have granules with little cup-shaped cavities
them, and are much higher than the columella, from which they
well separated above. They are wavy at the edges. The se
thin and not over close, are wavy here and there at their inner e
and are granular at the sides.

The calice is more circular than that of the larger form; an
body is shorter. Height $\frac{5}{8}$ inch.

This form can be comprehended by studying sections of la
and mature forms made near their bases. There the gran
and more or less distant septa hardly seem possibly to belong
coral which could develop such a close-set septal arrangemen
is seen above.

Both these specimens came from off the same shell.

A smaller individual of this species presents the peculiar ornamentation of the costæ near the calice and the shining epitheca. It is cylindrical in shape, and is just beginning to curve at the top; and it is fixed, by a base with two small offshoots, within the hollow of the valve of a shell. The calice is widely open, but has sharp margins and very slender and somewhat exsert and tolerably bent primary and secondary septa.

The primaries and secondaries are nearly equal; the tertiaries are much smaller; and the fourth and fifth orders of the fourth cycle of septa are very small. The larger septa are wavy within, very slender, and well separated.

The columella occupies considerable space, and is composed of about eight twisted band-like lamellæ, which are separate.

The pali are very small, and closely resemble the trabeculæ of the collumella; but their union low down with the septa can sometimes be seen. They are before the second and third orders of septa. The corallum is excessively slender and transparent.

Height of the coral $\frac{5}{16}$ inch.

At the base of the specimen just described, and within the same valve of a shell, is a very minute coral, which appears to be a still smaller form of *Caryophyllia cyathus*. It has a circular calice, six primary and six smaller or secondary septa; and there are twelve very small rudiments of the tertiary cycle. The larger septa are slightly enlarged at their inner ends; and there are no pali, the columellary trabeculæ being very small and apparently in one little bundle.

It is evident from the study of these specimens that the peculiar shining costal covering which has been termed a pellicular epitheca, but which does not appear to be a true outer thecal covering, is always present. The thickness of the septa and their crowded state seen in the adults is a matter of growth; and it is clear that the first stage of the coral shows three cycles of septa, the tertiary being rudimentary, and that in a more advanced stage there are four perfect cycles. The full number of septa is obtained during adult age; and the whole of the calcareous tissues increase then in thickness.

In examining some pieces of worn coral, probably originally forming part of a large *Dendrophyllia*, I found a small *Caryophyllia cyathus*. It has the peculiar epitheca, and is just in advance of the smallest specimen just noticed, so far as its growth is concerned.

There are four cycles of septa in some of the systems, and in the others only three. The columella is a twisted piece of tissue; and the pali are small but distinct and are before the secondaries.

Hence the coral with three cycles of septa in its early stage has no pali; they appear before the secondaries a little later, and subsequently before the tertiary; and this takes place when the fourth and fifth orders of septa are complete in a system. Then pali are developed before a higher order and eighteen result. The pali are deep in the calice, but project upwards; and they send processes inwards to join the twisted trabeculæ of the columella. The septa are marked low down by oblique rows of granules; but there is not a trace of any endotheca.

CARYOPHYLLIA CLAVUS, Scacchi, var. TINCTA.

The common British shallow-water coral is represented by a form at Madeira which cannot be separated from it specifically. Indeed it seems to be a simple variety, having a small columella, fewer septa, smaller pali; and the tint of the columella is pearly white, whilst that of the septa and costæ is reddish brown. The British variety *smithi* of Stokes is white, and is found below tide-mark in Devonshire.

The corallum is short, with a broad incrusting base, an ephitheca reaching far towards the margin; there are well-developed granular costæ above the epitheca, some projecting, and four complete cycles of septa with some orders of the fifth. The calice is deep, slightly elliptical in outline; and the columella is small, elongate and narrow, and is formed of a few tall twisted ribbon-shaped processes. The primary septa are exsert; and the secondaries are less so. The pali are small, and are before the third cycle of septa.

The granulation of the sides of the septa is in arched rows, one above the other; and the lateral projection of the granules from the free inner ends of the septa is decided.

Length of the calice $\frac{3}{8}$ inch.

Subdivision CARYOPHYLLIÆ ENDOTHECATÆ.

Amongst this collection of corals from Madeira is one which, whilst it presents all the characters of the genus *Caryophyllia*, possesses a distinct endotheca between its septa, occluding more or less the interseptal loculi here and there.

It is a most important form, especially when it is considered in relation to *Asterosmilia*, a genus of Trochocyathaceæ or Caryophylliæ with a double row of pali, and possessing endothecal dissepiments; for the possession of an endotheca has been considered to be of sufficient classificatory value to place genera with and without it in different families.

I propose including the new form amongst the species of *Caryophyllia*, giving it a subgeneric position.

CARYOPHYLLIA ENDOTHECATA, sp. nov. (Plate VIII. figs. 1–4.)

The coral is small, with a broad flat base, from which rises a more or less cylindrical body slightly constricted above the base, and narrowed and reentering at the calicular margin somewhat.

The calice is circular in outline, rather shallow near the margins, but much deeper at the columella, which consists of four or five distinct nodules. The septa are unequal, well apart, slightly exsert according to the order, and dip down, not reaching the columella. They are thin, slightly wavy in some instances; and the size of the primaries and secondaries distinguishes them. There are four cycles of septa in five systems and in one half of the sixth; but in

r half the higher orders are not developed. The pali follow
nary rule, and are before the tertiary septa in all systems
ie higher orders are fully developed; and consequently there
en long, narrow, wavy, very distinct, and well-developed

; is a decided endotheca just within the margin, whose edge
what inverted; and it covers some of the pali and occludes
interseptal loculi. In other parts dissepiments may be seen
ng between the septa. The costæ are numerous at the base,
in lines of granules or in faint ridges. Near the calice the
f the larger septa are the most projecting; and all are marked
anules, which, in some instances, assume a serpentine arrange-
There are faint traces of a pellicular epitheca.
ht of coral $\frac{6}{16}$ inch, length of calice $\frac{3}{16}$ inch.
ı Madeira.

Subfamily *Trochocyathaceæ*.

Jenus PARACYATHUS, Milne-Edwards & Haime, 1848.

ACYATHUS STRIATUS, Philippi, sp.

ral specimens of this widely-distributed form, with unlobed
d well-developed costæ, are from Madeira. The species is
m in the Mediterranean and in the Caribbean Sea.

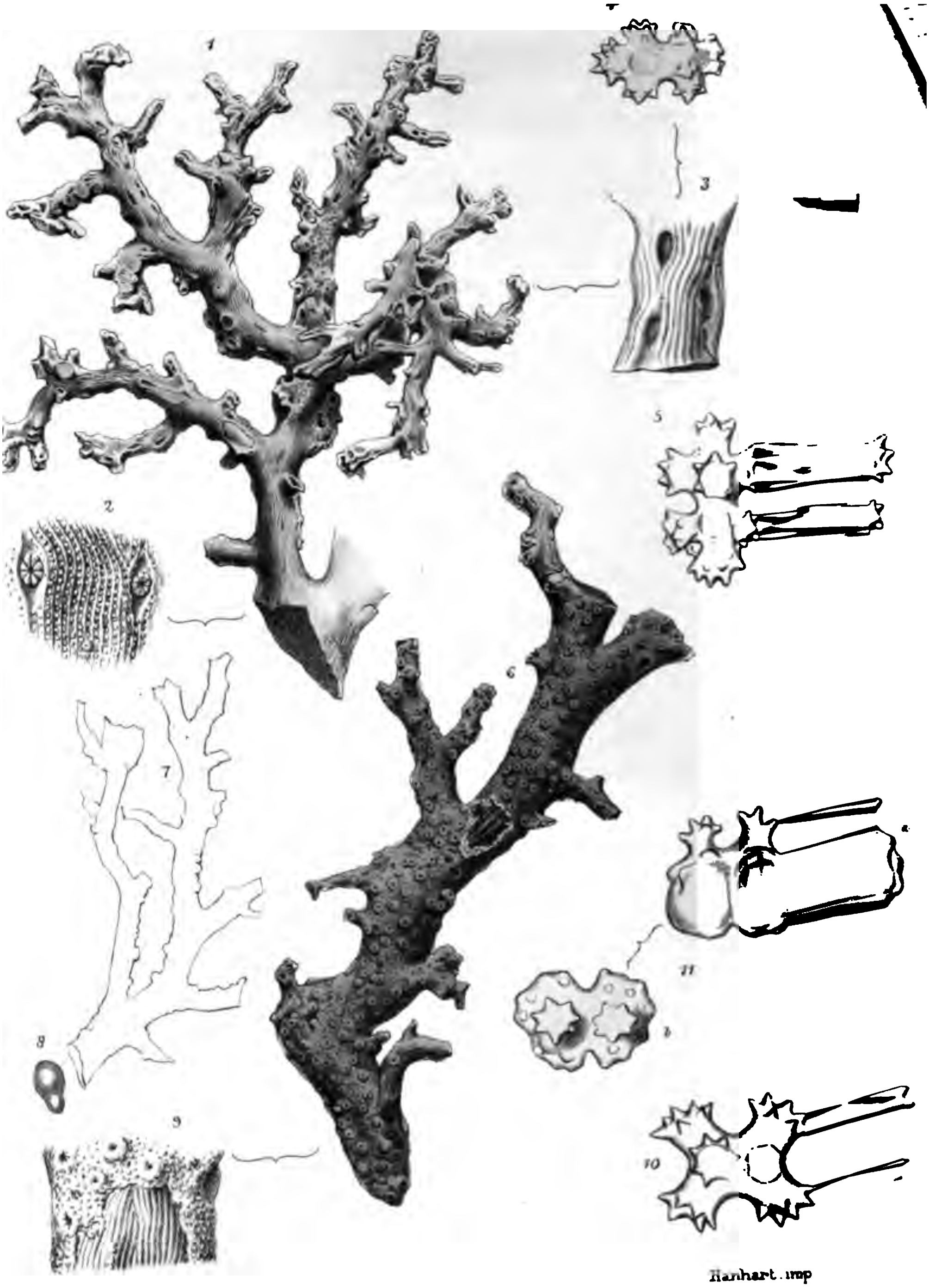
Subfamily *Turbinolinæ*.

re are four specimens of a simple coral in the collection from
ra, which were dredged at a depth of 30 fathoms in Funchal
and they represent three stages of the growth of the species.

us CERATOTROCHUS, Milne-Edwards & Jules Haime, 1848.

ATOTROCHUS JOHNSONI, sp. nov. (Plate VIII. figs. 5–8.)

coral is horn-shaped, bent, and has several growth-rings on
was attached by a narrow circular base, which has broken
ts support. The calice is wider than the rest of the body, is
; circular in outline, and its marginal wall is thin. The axial
is wide and deep; the septa are thin, wide apart, and rather
they are unequal, very slightly exsert, and do not reach far into
lice except in the instance of the larger ones. There are
l quite rudimentary septa in some parts of the calice; but
orrespond to costæ which are much larger in every respect.
ing these, the septa are twenty-seven in number, and counting
are forty-four in all. The arrangement in cycles is irregular;
ıere appear to be five primaries only. The margin between
epta has a festooned edge; and the interseptal spaces are
It is at the lowest point of the concavity of the festoon that
ıinute septa arise. The tertiary septa are smaller than the
daries, and they project well from the wall and reach down
the depths of the calice. The septa are rounded above; their
is rather straight within; and they are sometimes bent; and



Berjeau lith

Hanhart . imp

SPECIES OF CORALLIIDÆ.

Atlantic. The *Amphihelia* are found in the North Atlantic and Florida seas, besides off Madeira; but *Cladocora debilis* appears to be a local species. The *Balanophyllia* is new, and has no definite alliances. *Ceratotrochus johnsoni* is a remarkable form of a genus of very great distribution; and *Caryophyllia endothecata* is so important a coral that I shall venture to write a separate memoir about its bearings on classification.

EXPLANATION OF PLATE VIII.

Fig. 1. *Caryophyllia endothecata*, p. 216, natural size.
2. —— ——, the calice, magnified,
3. —— ——, interseptal loculi, magnified.
4. —— ——, costæ, magnified.
5. *Ceratotrochus johnsoni*, p. 217, natural size.
6. —— ——, a second specimen, natural size.
7. —— ——, the calice, magnified.
8. —— ——, the costæ, magnified.
9. *Balanophyllia brevis*, p. 219, natural size.
10. —— ——, magnified.
11. —— ——, calice, magnified.
12. —— ——, diagram of the septal arrangement.

On the Arrangement of the *Coralliidæ*, with Descriptions of new or rare Species. By STUART O. RIDLEY, M.A., F.L.S., &c., Assistant in the Zoological Department, British Museum. (Communicated by Dr. GÜNTHER, V.P.Z.S.)

[Received January 23, 1882.]

(Plate IX.)

The small group of species which has been thought worthy of separation from the rest of its Alcyonarian allies as a distinct family under the name *Corallidæ* (more correctly *Coralliidæ*), is chiefly remarkable in its structural characters for possessing a continuous stony axis, covered by only a thin cortical layer of a softer spiculiferous material, into which the polypes are retractile. Its best claim to general notice lies in the fact that the Precious Coral of commerce (*Corallium rubrum*, Costa, rectius *nobile*, Pallas) is one of the only three species hitherto known to exist in the seas of the present time which have been included in it. The other two species are scarcely known, even to students of the group. Thus but one specimen of the species described by Dana (U. S. Expl. Exped., vol. vii. p. 641, pl. lx. fig. 1) under the name of *Corallium secundum* seems to have ever been described; and but one specimen of the third species, described by the late Dr. Gray (P. Z. S. 1860, p. 393, Rad. pl. xviii.) under the name of *Corallium* (subsequently altered to *Hemicorallium*) *johnsoni*, was obtained in the first instance, and I know of no other authentic specimen. The original specimen of this species, however, is fortunately preserved in the national collection: that of

C. secundum is no doubt in America, in company with the oth specimens obtained at the same time by the United-States Explori Expedition. The Red Coral (*C. nobile*) occurs in the Mediterranea and among the islands (*e. g.* Cape-Verd Islands, see Wyvil Thomson, Voy. 'Challenger,' Atlantic, i. p. 76) lying off the N.W coast of Africa; it occurs nowhere[1] else, so far as I have been ab to discover. *C. secundum* is recorded with doubt as from the San wich Islands; it was probably obtained in the Pacific Ocean at an rate; *C. johnsoni* was obtained from Madeira. In the present pap is described a fourth species, and one which is probably not ne belonging to this remarkable and beautiful family: the one w obtained from the island of Mauritius, and is now in the collectio at the British Museum; the other is stated to come from Japan, an will shortly be incorporated with the same collection.

Arrangement of the Family.—The only attempt which has bee made at classifying the species is that of Dr. Gray in a Note rea before this Society, and published in its 'Proceedings' for 186 (p. 125), and somewhat amplified in 'Catalogue of Lithophytes o Stony Corals' (1870), p. 22. Dr. Gray divided the family and th original single genus *Corallium* into 3 genera, based mainly on th distribution of the "polypes" (meaning polype-cells, verrucæ o Verrill) on the branches, viz.:—

(1) *Corallium*, with the verrucæ slightly elevated from the corte and scattered on all sides of the branches (incl. *C. nobile*).

(2) *Pleurocorallium*, branching in a single plane; the verruc slightly raised, confined to one surface, and mostly placed on smal branches chiefly found near the edges of the main branches (incl *C. secundum*, Dana).

(3) *Hemicorallium*. The verrucæ prominent, all occurring on one side of the branches (incl. *C. johnsoni*, Gray).

With regard to this arrangment, it seems well to point out that the characters on which it is founded appeal entirely to the naked eye. In the allied members of the same group, the Alcyonaria, Prof. Kölliker (see 'Icones Histiologicæ') and Verrill (see various papers in the Proc. Essex Institute, Trans. Connecticut Academy, American Journal of Science, &c.) have shown good reasons for the belief that the majority of those characters, such as colour, manner of branching, presence or absence of anastomosis between branches, to which alone those writers can appeal who do not make use of a microscope in their researches, must be regarded as usually of no more than secondary importance in the estimation of the mutual affinities of the different subdivisions and species of this group. From personal study I can testify to the truth of this principle in the case of the *Melithæidæ*, which are probably the nearest allies of this family. In them anastomosis of branches may be simply a varietal circumstance; coloration of the internal parts is open to the same remark, and external coloration is far more frequently so; the manner of branching is much the same in all; so that, for classifiation, recourse has to be had mainly to the characters of the spicula and of the verrucæ.

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[1] It is found fossil in the Upper Pliocene and Quaternary deposits of South Italy, *cf.* Seguenza, Atti Ac. Linc. (3) Mem. sc. fis. mat. nat. iii. pp. 331, 373.

The want of good series of individuals of any known species of *Coralliidæ* except *C. nobile* is an obstacle to the full discussion of the natural relations of the different forms; a few facts only can be noted at present as bearing on the subject. Beginning with the comparatively common *Corallium nobile*, Pallas (*rubrum*, Costa) we find a cylindrical axis, usually branching seldom, but dichotomously and most commonly in an arborescent manner, which, though tending towards growth in one plane, yet almost invariably is actually in various planes; the cortex quite conceals any inequalities of the surface; and the verrucæ[1] (or calicles) project dome-like from all sides of the branches. Variations are frequent, especially in mode of growth; but these are by far the commonest characters of the species. The colour of the axis varies not uncommonly from crimson to pale red, rarely to yellow, and more rarely to white; the spicules are of one type, viz. a hexahedral oblong form, the angles being formed by broad truncate but microtuberculate tubercles, which preserve the chief features of their characteristic form throughout all varieties of the external form of the coral. (*Cf.* Lacaze-Duthiers, Hist. Nat. Corail, p. 70—"toutefois en recherchant bien, on finit par découvrir une forme qui, résumant toutes les autres, peut être regardée comme la type.")

Corallium (*Hemicorallium*, Gray) *johnsoni*, P. Z. S. 1860, p. 393, Radiata, pl. xviii., differs in several particulars from the former species, besides the branching essentially in one plane, the strictly anterior position of the verrucæ, and their considerable protrusion from the surface, which are the chief points insisted on by Dr. Gray. Thus the cream-coloured cortex is about ·5 mm. thick, about twice the thickness which it has in *C. nobile*; on the terminal branches the calicles rise abruptly from the surface, are truncate above, and measure 1·5 to 2 mm. in average diameter. The spicules have not hitherto been described; and their characters, in the one case, are so remarkable, and have such an important bearing on the affinities of both the genus and family to which the species belongs, that I now proceed to describe them.

Spicules of two kinds:—(i.) cylindrical, octoradiate, having a short stout shaft terminated at each end by a tubercle; two pairs of tubercles also project from each end of the shaft, in the same plane as the terminal ones, but at right angles to its long axis; on the anterior side (reckoning the two pairs of tubercles just mentioned as lateral) a tubercle projects at right angles to the long axis of the shaft, and also to the plane in which the lateral tubercles lie; on the posterior side a similar tubercle is similarly placed, but at the opposite end of the spicule; the ends of the short, broad, truncate tubercle are microtuberculate with few, sharp, smaller tubercles; size ·08 by ·053 mm.: this form is exactly similar to that of *C. nobile*, but is slightly smaller. Spicule no. ii. bilobate, having the form of a pair of

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[1] I think it best to adopt Verrill's term for those parts of the cortex which are specialized for the reception of the polypes.

ore globose [illegible] united by their sides;
asses, [illegible] what flattened at distal
or less [illegible] striction, their surface
proximal [illegible] each is attached a
of variable [illegible] bearing several long
third the length [illegible] larger lobes: average
n. long [illegible] across the two lobes;
ro-posteriorly [illegible] .44 mm.

ne cortex appears to be correlated with the
ed axis in the stem. Higher up this is distinctly
other species of *Hemicorallium*, *H. secundum*, the
ars to be associated with a striated stem. The
logical) appears to be that the cœnosarcal canals,
e grooved the surface of the axis, find sufficient
ortex when this is thick.

Pleurocorallium, Gray) *secundum*, Dana (U.S.
phytes, vol. vii. p. 641, Atlas, Zooph. pl. lx. fig. 1),
e mode of branching to be substantially that in one
the polypes are said to be confined to the front or
nches, but to be borne mostly on small branchlets or
over the edges and front of the main branches—an
ffering from that of both the preceding forms, but
hat to be described below in the new species *C. stylas*-
which this species further agrees in the growth in one
unately the spicular characters are unknown; but.
ances which have been found to exist between this and
bed below as a variety of it and agreeing in all generi-
nt characters with *Hemicorallium johnsoni*, I have little
similar generic identity with that species: therefore one
Pleurocorallium and *Hemicorallium* must give way,
er must stand, having precedence in description.
ium therefore = *Pleurocorallium*; and *Hemicorallium*
eurocorallium johnsoni.

the relations of *C. nobile* to the species described
under the name of *C. stylasteroides*, we find a thin
a low polype-verruca, and a spicule differing only in
only in those characters which, as I have stated, I
less essential in the classification of this Order, viz.
ching, colour, and form of axis (*i. e.* cylindrical or
on), that we find great differences; and the first two
been already seen to vary widely in *C. rubrum*, and in

belong to *Corallium* s. str., and is perhaps identical with *C. nobile* (see below, p. 232). In *C. beckii* the branches anastomose and are terminally dilated, both of which are characters quite wanting (as constant characters) in *C. nobile* as in all other known species; its systematic position in the family is quite uncertain.

I will now proceed to describe, first, the new species, and next the form which I have said is probably distinct, and then give a table showing the arrangement which these additions to our knowledge seem to render necessary. I will conclude with some remarks on the family and its allies, and some further notes on the fossil forms.

CORALLIUM STYLASTEROIDES, sp. nov. (Plate IX. figs. 1–4).

Normally branching in one plane. Stem stout, irregular in transverse section. Branching luxuriant, apparently normally dichotomous, but subject to considerable variation. Branches tortuous, decidedly compressed laterally in the case of all but the peripheral members, arising from the antero-lateral rather than the postero-lateral aspects of the stem or branches from which they may be derived, diminishing gradually in thickness towards the peripheral part. A few small branchlets are scattered on sides of the larger branches irregularly, and are, together with the terminal branchlets, generally subclavate in form, consisting of a slightly contracted basal portion and an enlarged, pointed, and polyhedric terminal portion. Posterior aspect of main branches very convex, of lesser branches less so. Axis of corallum hard, compact, but perforated by a few canals (normal, or due to parasites?) of about 1 mm. diameter, which issue distally at various points on the lateral aspects of the branches, the openings being often covered by a curved lamina of hard material; colour pure white throughout.

Longitudinal striæ of surface fine, about four to 1 mm.; grooves for polypes generally with a narrow raised lip on each side; length of grooves 1·5 to 2 mm. long (in direction of branches) by about ·75 mm. broad, and about ·5 mm. deep in the centre, which consists of a smooth-walled hemispherical pit. Surface of hard axis covered by a very thin spicular cortex, which does not conceal the subjacent striæ; it is beset with minute projecting points (visible only with the aid of a lens) arranged along the striæ of the hard axis; colour of cortex extremely pale orange. Verrucæ placed in the grooves above mentioned, not projecting beyond their margins, or in slight depressions distributed over all parts of the corallum, but most abundantly on the lateral aspects of the main branches, and on the small terminal and lateral projecting branchlets; their peripheral part consists of a pale pink collar, slightly darker than the general crust; the eight valves are very pale yellow in colour, actual diameter about ·75 mm.

Spicules of cortex of one kind only, viz. small, cylindrical, with one terminal tubercle at each end, and a whorl of 3 tubercles surrounding each end, and leaving a slight median space usually bare of tubercles; the tubercles are broad and truncate, the ends bearing several smaller angular tubercles which point outwards; size ·053 to ·058 mm. long by ·035 mm. broad (including the tubercles); shaft, excluding tubercles, about ·02 mm. broad.

Hab. Mauritius, 75 fathoms.

This species is based on a single dry specimen very finely preserved, obtained recently by the British Museum from a collector in Mauritius, Mr. V. De Robillard, together with some remarkably fine specimens of species of *Gorgoniidæ*. Its chief larger measurements are:—Main diameter of common stem[1] 11 mm.; largest branch—antero-posterior diameter at base 10 mm., lateral diameter 7 mm.; at 50 mm. from origin the same diameters are 7 mm. and 5 mm. respectively. Maximum transverse breadth of the whole corallum 135 mm., maximum height 105 mm.

The species differs from all to which names have been hitherto assigned in the elaborateness and peculiarities of its method of branching, with the exception of a specimen which was assigned by Dr. Gray (P. Z. S. 1867, p. 126) to his *Hemicorallium johnsoni*, and which then belonged to the Liverpool Free Museum. This specimen, differing as it does from the typical example of that species in the collection of the British Museum in its slender and strongly arborescent habit, appears to me to be entirely distinct from Dr. Gray's species, a fact which is apparently meant to be indicated by his subsequent statement (Cat. Lithophytes, p. 24) that the so-called animal of his figure is a fleshy Alcyonoid parasitic on a stony coral.

The present species agrees in the mode of branching in one plane with *C. secundum*, Dana (U.S. Expl. Exped., Zoophytes (vii.), p. 641, pl. lx. fig. 1), and also in the fact that many of the polypes are borne on small lateral branchlets; but differs from it (judging by the description) in having polypes on the posterior as well as the anterior surface, as also in the very pale pinkish colour of the cortex (that of *C. secundum* being scarlet), and the pure white of the hard axis (that of *C. secundum* being white and red). The small points which project from the cortex in the lines of Dana's striæ are, perhaps, represented by the small dots represented in Dana's enlarged figure of a polype with adjacent cortex; but these may just as well be *pits* as dots, according to the figure. Nothing is known of the spicules of *C. secundum*; but, as we have seen above, that species must be referred to the genus *Pleurocorallium*. Those of *C. stylasteroides* differ from those of the white variety of *C. nobile* only in their size, which is about one third less than that of the latter; but the excavations for the verrucæ (Plate IX. fig. 3), and the thinness of the cortex, are amply sufficient to prevent its being confounded with that form. The apparent anastomosis between some of the branches is due to fracture and subsequent adherence of the broken pieces to the remainder of the corallum, the reunited pieces having apparently contrived to live.

With regard to the axial tubes of 1 mm. diameter, alluded to in my diagnosis in uncertainty as to their import, they may possibly be due to the same causes as those which produce certain perforations, open at both ends, in the base of some of the small branches, and which are seen in parts forming passages covered in by a thin lamina of hard matter. The latter resemble so much the passages which are seen among the branches of many *Stylasteridæ*, and which are said (see Moseley, Report on Corals of the 'Challenger' Expedition, p. 78) in this case to be produced by the growth of the coral over an intruding Aphroditacean Worm which has adhered to the branches, that I must attribute with probability a similar origin to those of the *Corallium*.

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[1] Broken off from the actual base.

It is a different matter with the deeper tubes belonging to the main stem and branches. In the present base of the main stem, they are seen by its fracture to be excentric in position, somewhat variable in size: one of them contains a fine yellowish deposit containing minute siliceous particles and siliceous spicules, viz. spined acuates and acerates, about ·14 mm. long and ·009 to ·0177 thick, and acerates about ·28 by ·024 mm., with fragments of spinulates, triradiates, and some minute anchorate spicules. Lacaze-Duthiers (Hist. Nat. du Corail, Paris, 1864, p. 333) mentions small Annelids allied to the Serpulæ as sometimes attaching themselves to the surface of the Red Coral, and being covered up by the centrifugal growth of the corallum; but these tubes present no such distinct lining of carbonate of lime as this hypothesis demands. If not merely remains of the cœnosarcal canal-system, they are probably produced by the burrowing of boring Sponges (e. g. *Cliona*, *Samus*, *Alectona*), such as are common in *Stylaster* and Astræid Madrepores, or Worms (e. g. *Sipunculus*), such as occur in *Heteropsammia*. Lacaze-Duthiers attributes such cavities generally to "la érosion des éponges ou des vers," and mentions that such perforated specimens of coral are technically described as "piqué" by dealers. Some of the spicules mentioned above as occurring in one of the tubes appear to have been simply introduced with some bottom-material which has been accidentally washed into the tube, as their forms do not belong to any of the boring Sponges; but the spined forms mentioned may very well belong to a boring species allied to *Cliona purpurea*, Hancock, or *Alectona millari*, Carter, two species of boring Sponges.

Kölliker (Icon. Histiol. p. 146, pl. xvi. fig. 8) mentions and figures a smaller central cavity as occurring in some of his transverse sections of the Red Coral, but is unable to explain its occurrence. The question of the origin of the present passages receives, however, no help from Kölliker's observations, as his figure shows a discoloured ring surrounding the passages; they probably represent the horny axial tract found in the stems of most coralligenous Alcyonarians. In this case, if they prove to be constant in their occurrence, they would seriously interfere with the value of the coral for jewellery-purposes, should it be attempted in the future to put it, like the pale varieties of the Red Coral, to such a use. But the absence of a subtle tint of any kind, such as that which the varieties of the Red Coral generally possess, renders such an attempt improbable. The considerable depth at which this specimen was obtained, not being greater than that from which *Corallium* is brought to the surface in the Mediterranean, need not of itself prevent such an undertaking.

PLEUROCORALLIUM SECUNDUM, Dana, var. ELATIOR. (Plate IX. figs. 6–11).

Branching normally in one plane. Stem strong, oval in transverse section, the longest diameter being the lateral one. Mode of branching normally dichotomous combined with pinnation. Distance between points of origin of main branches considerable, but sides of branches occupied in these intervals by small branches or pinnæ, irregular in size and point of occurrence, occasionally found on the anterior surface; branches of main system decreasing gradually in thickness to the extremity of the corallum, somewhat tortuous, decidedly compressed from front to back in most places, the lateral diameter being to the antero-posterior about 11 : 9; pinnæ short, coming rapidly to a point, circular (or almost so) in transverse section, generally curved or tortuous, and not exceeding 20 mm. in length. Axis of corallum hard, not easily indented with a knife, solid; in main stem, and for a considerable distance up the main branches, of a deep crimson-red colour with a tinge of scarlet, resembling the colour of dried salmon's flesh; in the upper branches and the pinnæ the central portion of the axis becomes paler, being at first pink and finally white, this axial pale tract widening as it approaches the extremity of the branches or pinnæ, the axes of whose apices are white throughout. Surface of hard axis very finely striated in the longitudinal direction, with about five striæ to 1 mm., more deeply striated on smaller branches and pinnæ; surface otherwise even, with the exception of a tendency to roughness at the ends of the pinnæ, and very slight (almost imperceptible) shallow depressions beneath the calicles. Cortex about ·3 mm. in thickness, completely concealing all inequalities of the axis, except at ends of pinnæ; friable, of a pale vermilion colour; posterior and lateral surfaces even, and devoid of verrucæ, with the exception of a few scattered ones on and near the stem and at the ends of some pinnæ; anterior surface beset with verrucæ at intervals of 1 to 3 mm., and with minute punctiform elevations, visible only by the aid of a lens, uniformly distributed over the intermediate spaces to the number of about 25 in a square millimetre. Verrucæ broad, truncate above, rising abruptly from surface; of same colour as the general cortex; in retraction they may be completely closed; wrinkles between the 8 valves generally obsolete or very slight in the retracted state; diameter of verrucæ 1 to 1·25 mm., projection from cortex about ·5 mm.

Spicules of cortex of two kinds, viz.:—(i.) Cylindrical, sexradiate, colourless, with short thick axis; at each extremity two tubercles project from the side of the shaft (which does not project beyond them), at right angles to it; on each of the anterior and posterior aspects of the spicule (reckoning those which bear the above-mentioned four tubercles as the lateral ones) one tubercle is set at right angles to the long axis of the shaft, near its extremity, but at opposite ends of it; the spicule is thus sexradiate. (Varieties of the typical form occur, in which both the tubercles of the antero-posterior faces may be on one side; in this case one of them may be double, or one of them may be subterminal and appear to project beyond the end of the shaft; or one of them may be wanting, or one may occur in addition at one or both ends; in the latter case the result is an octoradiate like that of *Corallium nobile.*) Tubercles short, broad, expanding from their base into fungiform disks, themselves tuberculate with numerous short, rather blunt, small tubercles. Size (average maximum) 0·7 by 0·53 mm. (ii.) Second form of spicule shaped like an opera-glass, viz. like two short globular bottles attached by their sides; it consists of two subspherical lobes separated by a constriction, generally with tubercular excrescences borne on secondary lobes on their surface, and minute tubercles on their surface and edges; the upper margin of each lobe is produced into a short, strongly tuberculate, handle-like process of variable shape. Generally coloured pale red. Average maximum size:—length (across lobes) 0·6 mm., breadth (from apex of handle to lower extremity of lobes) 0·53 mm., maximum thickness of lobe from front to back 0·35 mm. (It is practically identical with the similar spicule of *P. johnsoni.*)

Hab. Said to come from Japan.

This most interesting form is represented by two portions, perhaps, but not certainly, belonging to the same colony. The long diameter of the present common stem of the larger specimen is 11 mm., the lesser diameter (antero-posterior) 9 mm.; these thicknesses are maintained approximately for most of the first internode, which is 25 mm. long; probable maximum lateral spread of branches 60 to 70 mm.; height above present base probably, when complete, about 200 mm.

Mr. Moseley has very liberally presented the specimens to the national collection; and I am much indebted to him for this opportunity of describing them. They were stated by the dealer from whom he obtained them to have been received from Japan, whence it was said that hundredweights came into the market, which, however, found but little sale. The locality is perhaps correct; but I have been unable, after diligent search, to find any record, either in scientific writings and travels, or in works of general information, of the occurrence of any native Japanese coral which was at all likely to belong to the *Coralliidæ*. To Messrs. Franks and Read, of the Ethnological Department in the British Museum, I am much indebted for information bearing on the subject. Mr. Franks has in his private collection a number of Japanese carved figures, called in Japan "netsuki," in most of which small dark men of a peculiar physiognomy, not Japanese, are represented as carrying coral, or (though this point is not so certain) as bringing it up from the sea. The coral thus depicted is either of actual specimens of *Corallium* or consists of carvings apparently representing it. Japanese writings call these men "black men." It is certain that they are not intended for Japanese; and as the men associated, whether in the ornaments or writings, with Precious Coral appear to be always of this foreign type, it seems certain that it is generally known in that country as a foreign product. The pieces of coral which actually form part of the ornaments, and which the men clasp or carry, is certainly not the form under notice, but appears to be *Corallium nobile* in all cases; it was of rather a pale colour in all the specimens which I have seen. All these specimens are antecedent in date of manufacture to the period at which the Japanese ports were opened to European commerce. Prof. Moseley has drawings of quite a similar character. Precious coral is widely used in the East for ornaments, especially in China, where Mr. Franks informs me that an Empress's necklace has been made of alternate pieces of jade and coral. In this case it is probably all derived from the Mediterranean, as the value placed upon it in the instance just mentioned is more than the Chinese would have set upon a native production, or probably even on one from Japan. Prof. Moseley says that the Japanese use *Corallium* as an ornament and in "netsukis" abundantly, that he imagined it came from the Mediterranean, but that several residents have told him that it occurs native in Japan. None was found there by the 'Challenger.' A friend of Prof. Moseley told him that he had seen plenty of Red Coral which had been obtained at Japan, but subsequently was doubtful that it might not have been a *Distichopora*.

After considering all the evidence, I have still doubts as to whether the present specimens really are from Japan. It seems certain that much *Corallium nobile* has been imported into that country, probably by way of China. This is shown by Mr. Franks's ornaments to constitute at any rate the main origin of this substance for manufacturing-purposes in Japan. As the present species, from its hardness, compact structure, and deep colour, is hardly less fitted for those purposes than *C. nobile* itself, it would almost certainly have been thus employed if it were generally known in the country.

In regard to the relations of the form, it may be seen at once to agree very closely with *Pleurocorallium johnsoni* (Pl. IX. fig. 5) in all essential characters, as the two forms of spicules, which are almost exactly identical in the two species—the cylindrical radiate of var. *elatior* having, however, but 6 radii as a rule; the axis, also, is striated and party-coloured in the stem, instead of white and smooth; and the cortex, besides being thinner, is scarlet instead of cream-coloured. However, it is undoubtedly a *Pleurocorallium*. Its relations to the original form of the species of which I have made it a variety are less certain. Unfortunately, as mentioned above, we are not acquainted with the characters of the spicules of *Pleurocorallium secundum*. From its resemblance to the present species in the party-coloured axis, pinnated branches, scarlet cortex with truncate Pleurocorallian verrucæ, it appears at any rate to be nearly related to it; but as the verrucæ are said to be placed mainly on the pinnæ and not, as here, on the face of the branches, I think it may possibly be distinct. In that case I should propose the name *elatius* for the present form, on account of its more erect and ramose habit; meanwhile it may stand as var. *elatior*. The pinnate arrangement of the lateral small branches on the sides of the large ones, the antero-posterior flattening, the rigidly anterior position of the verrucæ of the general surface, their abrupt projection and truncate extremity, separate it from all other species; while the minute characters, such as the double spicular complement, with its very remarkable form no. ii.—absent as it is from two of the recent *Coralliidæ* in which the spicules are known, and approximating the genus (as it appears to me to do) to the *Melithæidæ*, from its resemblance to the "Blattkeule" so widely distributed in that family—unmistakably show its true position to be by the side of *Pl. johnsoni*. The chief differences between the species are the red colour of the greater part of the hard axis and of the cortex, the absence of the terminal tubercles to the cylindrical spicule no. i., and the smaller size of the verrucæ, in the present form.

Key to the Genera, Species, and Varieties.

I have here endeavoured to present what appears to be the natural relations of the different forms, while giving characters which may readily distinguish them.

		Known habitats.
I. Spicules of one kind, viz. octoradiate cylindrical. Verrucæ distributed over whole surface of corallum, prominent, monticular ....CORALLIUM s. str.		
1. Corallum branching in more than a single plane.		
i. Axis cylindrical; spicules about ·09 mm. long.		
a. Axis crimson, cortex red	*C. nobile*, typical form.	Mediterranean; Cape Verd Isl.
β. Axis and cortex yellowish-white to white	*C. nobile*, pale var.	Mediterranean.
ii. Spicules ?; axis pale	*C. pallidum*, ?=*C. rubrum*.	Fossil: Tertiaries of Italy and Scinde; not earlier than Miocene.
2. Corallum branching in but one plane, calicles sunk in pits in axis. Axis oval in transverse section, white; spicules about ·06 mm. long; cortex very pale orange, very thin	*C. stylasteroides.*	Mauritius.
II. Spicules of two kinds, radiate cylindrical and opera-glass-shaped; calicles rising abruptly, truncate, those of stem and main branches confined to anterior surface. Corallum with lateral pinnæ to main branches. Axis oval in transverse section.........PLEUROCORALLIUM, Gray, emend.		
1. Axis partly red, partly white; cortex scarlet.		
i. Calicles chiefly on lateral pinnæ ...	*Pl. secundum*...	"Sandwich Is. ?"
ii. Calicles chiefly on main branches; cylindrical spicules normally 6-radiate	*Pl. secundum*, var. *elatior*.	Japan ?
2. Axis white, cortex cream-coloured; cylindrical spicules normally 8-radiate	*Pl. johnsoni*	Madeira.
III. (*incertæ sedis*). Corallum with branches anastomosing, apices nodose	*Corallium beckii*	Fossil; White Chalk of Faxöe.

Col. St. John writes to me as follows respecting this animal:—

"The Markhore was caught in the hills at the upper end of the Bolan Pass. The popular story there is that the Pass itself divides the two species of *Capra*—*C. megaceros* never being found to the west, nor *C. ægagrus* to the east of the Pass. The insignificant dimensions of the Pass make the truth of this story impossible; and shikaris have assured me that both species are found on the Chilten Mountains, N.W. of the head of the Pass. But the Bolan is *about* the line where the two meet; and I am inclined to doubt whether *C. megaceros* is ever found in the Helmund valley proper."

Amongst the deaths in February I regret to have to record that of the Great Ant-eater (*Myrmecophaga jubata*), presented by Dr. John A. Palin, C.M.Z.S., October 4, 1867. It is, however, I suppose, unprecedented that an animal of this delicate nature should live so long as 14 years in captivity.

The following papers were read:—

1. List of the Lepidoptera collected by the Rev. J. H. Hocking, chiefly in the Kangra District, N.W. Himalaya; with Descriptions of new Genera and Species.—Part I. By F. Moore, F.Z.S.

[Received January 25, 1882.]

(Plates XI., XII.)

The collection of Lepidoptera, of which the following is a list, was formed by Mr. Hocking whilst resident for several years at the hill-station of Dharmsala, and has been placed in my hands by Lord Walsingham for examination. Many of the species are accompanied by well-preserved specimens of the dried larval skin and pupa, several of which were previously unknown, and are therefore an exceedingly valuable contribution to our knowledge of their earlier stages.

RHOPALOCERA.

NYMPHALIDÆ.

Euplœinæ.

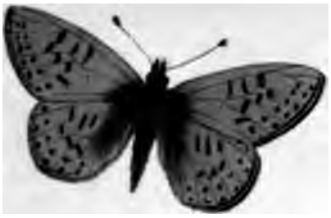
Salatura genutia.

Papilio genutia, Cramer, Pap. Exot. iii. pl. 206. f. C, D (1779).
Papilio plexippus (part.), Fabr. Spec. Ins. p. 55.

Limnas chrysippus.

Papilio chrysippus, Linn. S. N. i. 2. p. 767 (1767).

Jullundur, in the plains, January 21st. Larva on madar (*Calotropis gigantea*).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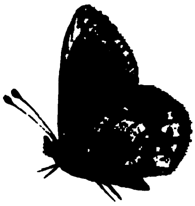
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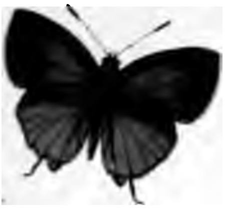
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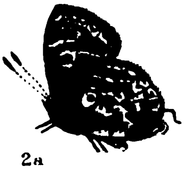
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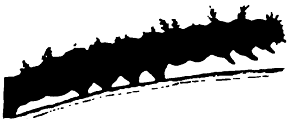
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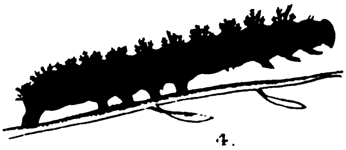
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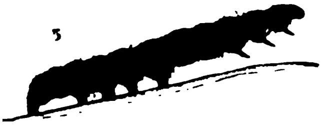
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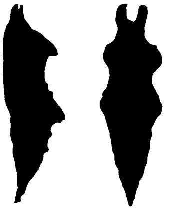
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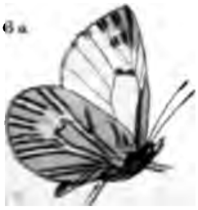
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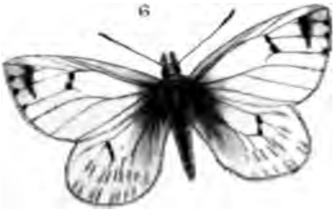
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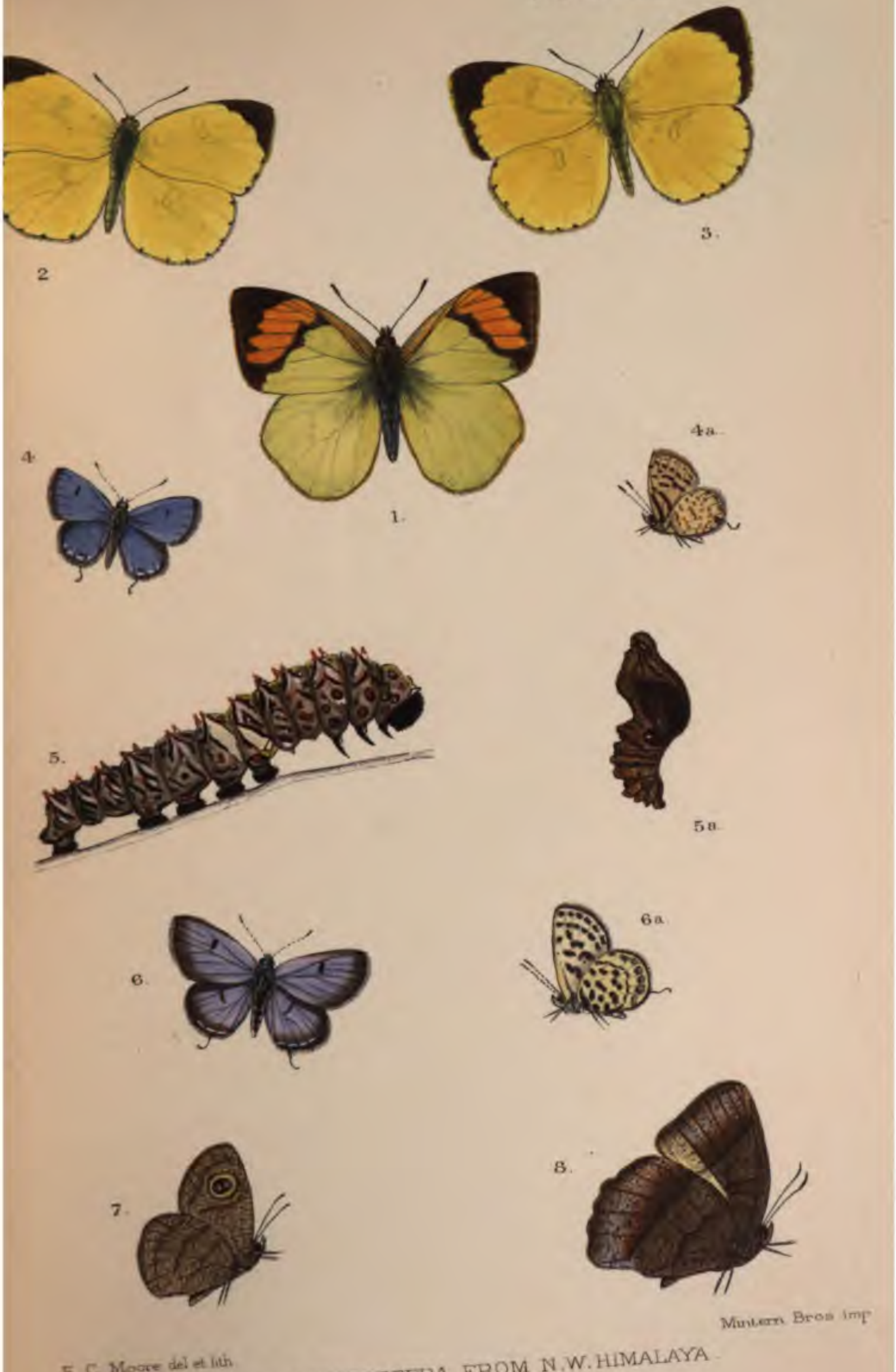
Moore del. et lith. Mintern Bros imp.

NEW LEPIDOPTERA FROM N W. HIMALAYA.

P.Z.S.1882. Pl. XII.



Mintern Bros imp.

F. C. Moore del et lith.

NEW LEPIDOPTERA FROM N.W. HIMALAYA.

TIRUMALA LIMNIACÆ.

Papilio limniacæ, Cramer, Pap. Exot. i. pl. 59. f. D, E (1775).

TIRUMALA SEPTENTRIONIS.

Danais septentrionis, Butler, Ent. Monthly Mag. 1874, p. 163.

CADUGA TYTIA.

Euplœa tytia, Gray, Lep. Ins. of Nepal, p. 9, pl. 9. f. 2 (1833–46).

Danais sita, Kollar, Hügel's Kaschmir, iv. p. 424, pl. 6 (1844).

Kangra valley.

"Double-brooded, March and July. Flies up to about 50 feet, and sails along motionless, and then sweeps down, but not very rapid."

CRASTIA VERMICULATA.

Euplœa vermiculata, Butler, P. Z. S. 1866, p. 276.

SATYRINÆ.

LETHE ROHRIA.

Papilio rohria, Fabricius, Mant. Ins. ii. p. 45.

LETHE DYRTA.

Debis dyrta, Felder, Reise Novara, Lep. iii. p. 497 (1867).

LETHE HYRANIA.

♂. *Satyrus hyrania*, Kollar, Hügel's Kaschmir, iv. p. 449, pl. 17. f. 1, 2 (1844).

♀. *Satyrus isania*, Kollar, id. p. 448, pl. 16. f. 3, 4.

LETHE SIDONIS.

Debis sidonis, Hewitson, Exot. Butterflies, iii. p. 77, *Deb.* pl. 39. f. 16 (1863).

LETHE NICETAS.

Debis nicetas, Hewitson, Exot. Butterflies, iii. p. 78, *Deb.* pl. 39. f. 17, 18 (1863).

TANSIMA VERMA.

Satyrus verma, Kollar, Hügel's Kaschmir, iv. p. 447, pl. 16. f. 1, 2 (1844).

MELANITIS ISMENE.

Papilio ismene, Cramer, Pap. Exot. i. pl. 26. f. A, B (1775)

MELANITIS BELA.

Melanitis bela, Moore, Catal. Lep. Mus. E.I. C. i. p. 223 (1857).

ORINOMA DAMARIS.

Orinoma damaris, Gray, Lep. Ins. Nepal, p. 14, pl. 7. f. 2, 2*a* (1846); Doubleday & Hewits. D. Lep. pl. 63. f. 3.

"Taken at Jatingri. Very local and rare."

RHAPHICERA MOOREI.

Rhaphicera moorei, Butler, Ann. Nat. Hist. 1867, p. 164, pl. 4. f. 4, 4 *a*, ♀.

AMECERA SCHAKRA.

Satyrus schakra, Kollar, Hügel's Kaschmir, iv. p. 446, pl. 15. f. 3, 4 (1844).

HIPPARCHIA PARISATIS.

Satyrus parisatis, Kollar, Denkschrift Akad. Wien, math.-nat. Cl. i. p. 52 (1850).

"Kangra valley; during the rains, June to September. Always settles underneath overhanging rocks."

AULOCERA SWAHA.

Satyrus swaha, Kollar, Hügel's Kaschmir, iv. p. 444, pl. 14. f. 1, 2 (1844).

AULOCERA SARASWATI.

Satyrus saraswati, Kollar, Hügel's Kaschmir, iv. p. 445, pl. 14. f. 3, 4 (1844).

AULOCERA PADMA.

Satyrus padma, Kollar, Hügel's Kaschmir, iv. p. 445, pl. 15. f. 1, 2 (1844).

AULOCERA AVATARA.

Satyrus avatara, Moore, Catal. Lep. Mus. E.I. C. i. p. 229 (1857).

"Fly in June. Settle on the ground or rocks; 9000 feet; *A. padma* higher up than the others, 9000–10,000 feet."

CALLEREBIA SCANDA.

Erebia scanda, Kollar, Hügel's Kaschmir, iv. p. 452, pl. 17. f. 3, 4 (1844).

CALLEREBIA NIRMALA.

Erebia nirmala, Moore, P. Z. S. 1865, p. 501.

CALLEREBIA INTERMEDIA, n. sp.

Intermediate between *C. nirmala* and *C. cashapa*. Upperside similar to *C. nirmala*, with one ocellus only on each wing. Underside with two lower ocelli, a third ocellus between the upper median and radial veins, and two small apical spots above.

Expanse, ♂ $2\frac{1}{10}$, ♀ $2\frac{4}{10}$ inches.

Hab. Kangra district. In coll. British Museum.

CALLEREBIA CASHAPA, n. sp.

Allied to *C. nirmala*. Male and female comparatively larger in size. Upperside similar, but the hind wing having three well-formed ocelli, the one between the radial and upper median vein sometimes absent. Underside—fore wing less brightly chestnut coloured: hind wing with a complete series of ocelli, one between each vein; some specimens with three anterior and two posterior ocelli, the upper one and sometimes the lowest being minute.

Expanse 2 to $2\frac{2}{10}$ inches.

Hab. Dharmsala (*Hocking*); Masuri (*Lang*); Simla. In coll. British Museum & F. Moore.

CALLEREBIA ANNADA.

Erebia annada, Moore, Catal. Lep. Mus. E.I. C. i. p. 226 (1857).

CALLEREBIA HYBRIDA.

Callerebia hybrida, Butler, P. Z. S. 1880, p. 147.
Callerebia nada, Moore, P. Z. S. 1881, p. 306.

CALLEREBIA SHALLADA.

Erebia shallada, Lang, Journ. Asiat. Soc. Beng. 1880, p. 247.

EPINEPHILE PULCHELLA.

Epinephile pulchella, Felder, Reise Novara, Lep. iii. p. 490, pl. 69. f. 16 (1867).

Lahoul.

A distinct species from *E. neoza*, Lang.

CALYSISME BLASIUS.

Papilio blasius, Fabricius, Ent. Syst. Suppl. p. 426 (1798).

CALYSISME PERSEUS.

Papilio perseus, Fabricius, Syst. Ent. p. 488 (1775).
Papilio otrea, Cram. Pap. Exot. iv. pl. 314. f. A, B (1780), ♀.
Satyrus zopyrus, Kollar, Hügel's Kaschmir, iv. p. 450 (1844).

CALYSISME SUBFASCIATA, n. sp. (Plate XII. fig. 8.)

Nearest allied to *C. visala*. Upperside of both sexes with greyer marginal border, and the ocellus on fore wing only half the size. Underside of both sexes much greyer, more densely covered with black-speckled strigæ, the two transverse lines comparatively nearer each other, and the outer line bordered by a broad chestnut-brown suffused fascia.

Expanse, ♂ $1\frac{7}{8}$, ♀ 2 inches.

Hab. Dharmsala. In coll. Rev. Hocking.

YPTHIMA NIKÆA.

Ypthima nikæa, Moore, P. Z. S. 1874, p. 567.

YPTHIMA BALDUS.

Papilio baldus, Fabricius, Syst. Ent. App. p. 809 (1775); Donov. Ins. India, pl. 36. f. 2.

YPTHIMA AVANTA.

Ypthima avanta, Moore, P. Z. S. 1874, p. 567.

YPTHIMA INDECORA, n. sp. (Plate XII. fig. 7.)

Nearest to *Y. inica*, Hewits. Upperside brown: fore wing with a darker subbasal oblique shade; a prominent, bipupilled, subapical ocellus: hind wing with two smaller subanal ocelli. Underside covered with very slender grey strigæ; two very faint brown fasciæ crossing middle of both wings, those on the hind wing waved: hind wing with two subapical and three subanal, extremely minute, and indistinct silver-pupilled ocelli.

Expanse, ♂ $1\frac{2}{8}$, ♀ $1\frac{3}{8}$ inch.

Hab. Kangra district. In coll. Rev. Hocking & F. Moore.

YPTHIMA NAREDA.

Satyrus nareda, Kollar, Hügel's Kaschmir, iv. p. 451 (1844).

Ypthima nareda, Hewits. Trans. Ent. Soc. Lond. 1865, p. 2[illegible]85, pl. 17. f. 6 (nec f. 7).

NYMPHALINÆ.

DILIPA MORGIANA.

Apatura morgiana, Westw. Doubleday's Gen. D. Lep. p. [illegible]05 (1850).

Dilipa morgiana, Moore, Catal. Lep. Mus. E.I. C. i. p. 2[illegible]1, pl. 6 *a*. f. 5.

"August. 6000 feet."

LIMENITIS TRIVENA.

Limenitis trivena, Moore, Ent. Monthly Mag. 1864, p. 133.

CHARAXES FABIUS.

Papilio fabius, Fabricius, Spec. Ins. ii. p. 12 (1781), ♂.

Papilio solon, Fabr. Ent. Syst. iii. 1, p. 69 (1793), ♀.

"Dharmsala; July. Taken at sugar."

EULEPIS ATHAMAS.

Papilio athamas, Drury, Ill. Exot. Ins. i. pl. 2. f. 4 (1773).

Kangra; Kulu; 3000 feet.

EULEPIS HAMASTA, n. sp.

Smaller than *E. athamas*. Fore wing differs in the medial band being broader in the male, the subapical spot also broader and more regularly quadrate, its upper angle being nearer the apical spot, of which latter there are two in the female, one above the other: hind wing with a more prominent submarginal series of white spots, the three lower spots being conspicuously larger and lunular in shape, with contiguous greyish outer lunules.

Expanse $2\frac{1}{2}$ to $2\frac{3}{4}$ inches.

Hab. Dharmsala, 6200 feet; March, June. In coll. British Museum.

"The wildest butterfly that I know. Takes very long flights at a time and returns to the same point. Very shy."

EUTHALIA GARUDA.

Adolias garuda, Moore, Catal. Lep. Mus. E.I. C. i. p. 186 (1857); Trans. Ent. Soc. 1859, p. 64, pl. 3. f. 2.

"Larva feeds on mango. October."

EUTHALIA PATALA.

Adolias patala, Kollar, Hügel's Kaschmir, iv. p. 435 (1844).

"Flys about oaks. June to September."

STIBOCHIONA NICEA.

Adolias nicea, Gray, Lep. Ins. Nepal, p. 13, pl. 12. f. 1 (1846).

"Flies like *Papilio pammon*, following the line of a hedge and passing in and out between the bushes."

SYMPHÆDRA NAIS.

Papilio nais, Forster, Novæ Spec. Ins. Cent. i. p. 73 (1771).

Papilio thyelia, Fabr. Ent. Syst. iii. 1, p. 142 (1793); Donov. Ins. India, pl. 31. f. 3.

"Kangra district generally; banks of the Beas, about 2000 feet elevation."

KALLIMA HUGELI.

Paphia hugelii, Kollar, Hügel's Kaschmir, iv. p. 432, pl. 9 (1844).

Kallima hugelii, Moore, Trans. Ent. Soc. 1879, p. 12.

"Single-brooded in July. Flies about till the cold weather in November, and then hibernates, and comes out again in April. Taken at sugar in April."

PRECIS IPHITA.

Papilio iphita, Cram. Pap. Exot. iii. pl. 209. f. C, D (1779).

"Always pitches on the ground."

JUNONIA LEMONIAS.

Papilio lemonias, Linn. Syst. Nat. i. 2, p. 770 (1767).

JUNONIA ORITHYA.

Papilio orithya, Linn. Syst. Nat. i. 2, p. 770 (1767).

JUNONIA ÆNONE.

Papilio ænone, Linn. Syst. Nat. i. 2, p. 770 (1767).

JUNONIA ASTERIE.

Papilio asterie, Linn. Syst. Nat. i. 2, p. 769 (1767).

JUNONIA ALMANA.

Papilio almana, Linn. Syst Nat. i. 2, p. 769 (1767); Donov. Ins. China, pl. 38. f. 2.

PSEUDERGOLIS WEDAH.

Ariadne wedah, Kollar, Hügel's Kaschmir, iv. p. 437 (1844).
Precis veda, Kirby, Catal. Lep. p. 191 (1871).
Precis hara, Moore, Catal. Lep. Mus. E.I. C. i. p. 143, pl. 3a. f. 1 (1857).

ERGOLIS ARIADNE.

Papilio ariadne, Linn. Syst. Nat. i. 2, p. 778 (1767).

CYRESTIS THYODAMAS.

Cyrestis thyodamas, Boisd. Cuvier's Règ. Anim., Ins. ii. pl. 38. f. 4 (1836).
Amathusia ganescha, Kollar, Hügel's Kasch. iv. p. 430, pl. 7. f. 3, 4 (1844).
"June to September; hibernates afterwards. Sits with o[illegible]en wings upon hanging leaves of oak and rhododendron."

VANESSA CHARONIA.

Papilio charonia, Drury, Illust. Exot. Ins. i. pl. 15. f. 1, 2 (1773).

VANESSA XANTHOMELAS.

Papilio xanthomelas, Denis et Schiff. Wien. Verz. p. 175 (1776).
"Larva on willow, March 30. Fed up April 6th; in pup[illegible] state from 16th to 24th; imago emerged May 9th."

VANESSA KASCHMIRENSIS.

Vanessa kaschmirensis, Kollar, Hügel's Kasch. iv. p. 442, pl. 11. f. 3, 4 (1844).
"Larva on nettle, April."

PYRAMEIS CARDUI.

Papilio cardui, Linn. Syst. Nat. i. 2, p. 774 (1767).
"Larva on nettle; May and August, 6200 feet."

PYRAMEIS INDICA.

Papilio indica, Herbst, Naturs. Schmett. vii. pl. 180. f. 1, 2 (1794).

SEPHISA[1] DICHROA.

Limenitis dichroa, Kollar, Hügel's Kasch. iv. p. 429, pl. 8. f. 1, 2 (1844).
Castalia dichroa, Moore, Catal. Lep. Mus. E.I. C. i. p. 199.

HESTINA ZELLA.

Hestina zella, Butler, Trans. Ent. Soc. 1869, p. 9, fig.
Kangra district generally.

NEPTIS ASTOLA.

Apatura jacintha.

Papilio jacintha, Drury, Illust. Exot. Ins. ii. pl. 21. f. 1, 2 (177[redacted]).

"Hills, June to September. Settling upon oak (*Quercus inca*[redacted]*a*). Never found in company with preceding."

Acidalia niphe.

Papilio niphe, Linn. Syst. Nat. i. 2, p. 785 (1767); Dr[redacted]ry, Illust. Exot. Ins. i. pl. 6. f. 1.

"Found in the valleys."

Argynnis childreni.

Argynnis childreni, Gray, Zool. Misc. p. 33 (1831); Lep. [redacted]ns. Nepal, p. 11, pl. 11.

Argynnis sakontala, Kollar, Hügel's Kasch. iv. p. 439, pl. 12 (1844).

"On thistles, 6000 feet."

Argynnis jainadeva.

Argynnis jainadeva, Moore, Ent. Monthly Mag. 1864, p. 131 P. Z. S. 1865, p. 495, pl. 30. f. 1.

Argynnis issæa.

Argynnis issæa, Moore, Catal. Lep. Mus. E.I. C. i. p. 156 (1857).

"Hills, flying over the grassy slopes."

Argynnis baralacha, n. sp. (Plate XI. figs. 1, 1 *a*.)

Male. Upperside fulvous; lower basal area of both wings minutely black-speckled: fore wing with a black recurved streak within the cell, a lunular streak at its end; a discal transverse zigzag series of broader streaks, two outer rows of small spots, which are indistinct at the apex, and a marginal, indistinct, dentated lunular speckled line: hind wing with two less distinct and more slender cell-streaks, discal row of spots, two outer rows of spots (of which the inner row is indistinct), and a marginal speckled line.

Underside—fore wing paler fulvous, with the cell, discal, and inner row of black spots as above showing very indistinctly; the costal border, two streaks from the apex, and short X-shaped marginal marks being yellow: hind wing yellow, with a very irregular transverse subbasal, discal, and a marginal fulvous-red band; the subbasal band bordered outwardly by linear pearly streaks, the discal band by indistinct pearly lunules, and the marginal band traversed by pearly X-shaped marks; the discal and marginal bands more or less confluent; a small pearly spot also within the cell.

Expanse 1⅝ inch.

Hab. Ladak. In coll. British Museum.

Melitæa cashmirensis.

Melitæa cashmirensis, Moore, P. Z. S. 1874, p. 267, pl. 43. f. 4.

MELITÆA BALBITA.

Melitæa balbita, Moore, P. Z. S. 1874, p. 268, pl. 43. f. 5.

"Rhotung Pass."

SYMBRENTHIA HYPPOCLUS. (Plate XI. figs. 4, 4 *a*, larva.)

Papilio hyppoclus, Cramer, Pap. Exot. iii. pl. 220. f. C, D (1782).

"Larva on nettle, August, 6200 feet."

ATELLA PHALANTA.

Papilio phalanta, Drury, Illust. Exot. Ins. i. pl. 21. f. 1, 2 (1773).

"Found in the valleys."

ACRÆINÆ.

PAREBA VESTA.

Papilio vesta, Fabr. Mant. Ins. ii. p. 14 (1787).

Acræa anomala, Kollar, Hügel's Kasch. iv. p. 425, pl. 3. f. 3, 4 (1844).

"Larva feeds on the willow-leaved nettle (*Bœhmeria talicifolia*). Imago, July to September. Eggs deposited in September, and hatch in about twenty days. Length of young larva 3 to 4 lines, entirely black. When about three weeks old they moult and then hibernate, reappearing in the following April. They moult again early in May, when they assume the red head. The larvæ generally feed on the upper branches of the plant, are gregarious, and drop to the ground when disturbed. Third moult early in June, about the middle of which month they suspend themselves by the tail near the bottom of the stems of the bushes, and there change to the pupa state. The imago appears in about fifteen days, in the first or second week in July. A few come out in August and September, but not in sufficient numbers to constitute a succession of broods. The imago is seldom found far from the food-plant, which grows near running water.

"It is a very local insect, but, where occurring, abundant. It is to be found in wet ravines at from 3000 to 4000 feet elevation in Kulu. It is not a rapid flier, and is easily captured. When at rest it may be taken by the fingers. It is very constant in its appearance, frequenting the same localities year after year. The imago does not hibernate."—*Note by A. Graham Young.*

ERYCINIDÆ.

LIBYTHÆINÆ.

LIBYTHEA MYRRHA.

Libythea myrrha, Godt. Enc. Méth. ix. p. 171.

"Kangra valley, May to December. A tree-perching insect. Settles with vertical wings."

NEMEOBIINÆ.

DODONA DURGA.

Melitæa durga, Kollar, Hügel's Kaschmir, iv. p. 441, pl. 13. f. 3, 4 (1844).

DODONA EUGENES.

Dodona eugenes, Bates, Journ. Linn. Soc., Zool. ix. p. 371 (1867).

ABISARA SUFFUSA, n. sp.

Allied to *A. angulata*, Moore (P. Z. S. 1878, p. 833). Smaller, the male being of a deeper tint, with the fasciæ straighter and suffused with grey. Female of a much duller colour and suffused with grey, the medial transverse dark fascia less angular on both wings, and the outer fasciæ much less distinct, broader, and more suffused.

Expanse, ♂ $1\frac{5}{8}$, ♀ $1\frac{4}{8}$ inch.
Hab. Chumba, 10,000 feet. In coll. British Museum.

LYCÆNIDÆ.

PITHECOPS ZALMORA.

Pithecops zalmora, Butler, Catal. Fabrician Lep. Brit. Mus— p. 161 (1870).

CURETIS DENTATA.

Curetis dentata, Moore, P. Z. S. 1879, p. 138.

CYANIRIS CŒLESTINA.

Lycæna cœlestina, Kollar, Hügel's Kaschmir, iv. p. 423 (1844).
Lycæna kollari, Westwood, Doubleday's Gen. D. Lep. p. 491 (1852).
Polyommatus kasmira, Moore, P. Z. S. 1865, p. 503, pl. 31. f. 1.

CYANIRIS HUEGELII.

Lycæna argiolus, Kollar, Hügel's Kaschmir, iv. p. 423 (nec Linn.).

Differs from *C. cœlestina* in its larger size. *Male.* Upperside similar in colour, but of a darker blue tint; fore wing with a more slender blackish marginal band; hind wing with a clearly defined marginal line. *Female* more dusky throughout than in *C. cœlestina*; fore wing with broader blackish marginal borders and discocellular lunule; hind wing with the blackish costal border and marginal spots broader, the latter with well-defined inner pale dentate marks, the inner area beyond and the veins also dusky-black. Underside with similar but more distinct markings than in *C. cœlestina*, the discal series on the hind wing more linear in shape, the marginal spots and submarginal lunular band much more prominent.

Expanse, ♂ ♀ $1\frac{5}{12}$ to $1\frac{8}{12}$ inch.
Hab. N.W. Himalaya (Kaschmir; Simla; Masuri; Dharmsala). In coll. F. Moore and British Museum.

This species has hitherto been considered to be Kollar's *L. cœlestina*; but both his description and measurements undoubtedly agree with *C. kasmira*.

CYANIRIS VARDHANA.

Polyommatus vardhana, Moore, P. Z. S. 1874, p. 572, pl. 66. f. 5.

CYANIRIS PUSPA.

Polyommatus puspa, Horsf. Catal. Lep. Mus. E.I. C. (1828), p. 67.

"Kulu."

CHILADES VARUNANA.

Polyommatus varunana, Moore, P. Z. S. 1865, p. 772, pl. 41. f. 6.

CHILADES PUTLI.

Lycæna putli, Kollar, Hügel's Kaschmir, iv. p. 422 (1844).

ZIZERA MAHA.

Lycæna maha, Kollar, Hügel's Kaschmir, iv. p. 422 (1844).
Lycæna chandala, Moore, P. Z. S. 1865, p. 504, pl. 31. f. 5.

ZIZERA INDICA.

Lycæna indica, Murray, Trans. Ent. Soc. 1874, p. 525, pl. 10. f. 2, 3.

ZIZERA PYGMÆA.

Lycæna pygmæa, Snellin, Tijd. voor Ent. xix. p. 153, pl. 7. f. 3 (1876).

Identical with Sumatran and Ceylonese specimens.

AZANUS UBALDUS.

Papilio ubaldus, Cram. Pap. Exot. iv. pl. 390. f. L, M (1782).
Lycæna zena, Moore, P. Z. S. 1865, p. 505, pl. 31. f. 9.

TARUCUS NARA.

Lycæna nara, Kollar, Hügel's Kaschmir, iv. p. 421 (1844).

TARUCUS ALTERATUS, n. sp. (Plate XII. figs. 4, 4 *a*.)

Also allied to *T. nara*; smaller; colour paler and of a more decided blue tint; fore wing with a slender discocellular dusky lunule; hind wing with a small dusky spot above the tail, and a slender marginal white line. Cilia brownish white. Underside dull pale greyish ochreous; both wings with similarly disposed markings, which are more slender, paler, and much less distinct, those on the hind wing being reddish ochreous, the marginal metallic spots more or less golden.

Expanse $\frac{10}{12}$ inch.

Hab. N.W. Himalaya (*Reid*); Dharmsala (*Hocking*). In coll. F. Moore and British Museum.

TARUCUS VENOSUS, n. sp. (Plate XII. figs. 6, 6 *a*.)

Allied to *T. theophrastus* and *T. nara*. Wings larger and broader; fore wing less triangular, the exterior margin more convex; colour duller blue and of a slight violaceous tinge; both wings with a broad marginal dusky border, similar to that in male of *Zizera chandala*; veins dark-lined: fore wing with a broad dusky spot, and hind wing with a slender lunule at end of the cell, and a slender white marginal line above the tail. [illegible] brown, with the exception of a very few [illegible] posed on the basal area; an indistinct darker [illegible] and a spot above the tail. Cilia whitish. [illegible] the above species, all the markings, however, [illegible] sexes.

Expanse, ♂ ♀, 1$\frac{1}{12}$ inch.

Hab. Dharmsala. In coll. British Museum.

TARUCUS PLINIUS.

Hesperia plinius, Fabr. Ent. Syst. iii. p. 284 [illegible] Ins. India, pl. 41. f. 1.

CASTALIUS ROSIMON.

Papilio rosimon, Fabr. Syst. Ent. p. 523 (177[illegible].

EVERES DIPORA.

Lycæna dipora, Moore, P. Z. S. 1865, p. 506, pl. [illegible]

NACADUBA ARDATES.

Lycæna ardates, Moore, P. Z. S. 1874, p. 574, pl. [illegible]
"Kulu."

CATOCHRYSOPS STRABO.

Hesperia strabo, Fabr. Ent. Syst. iii. p. 287 (1793).
Lycæna kandarpa, Horsf. Catal. Lep. Mus. E.I. C. (1[illegible], p. [illegible]
Lycæna asoka, Kollar, Hügel's Kasch. iv. p. 419, ♂.
Lycæna didda, Kollar, Hügel's Kasch. iv. p. 420, ♀.

CATOCHRYSOPS CNEJUS.

Hesperia cnejus, Fabr. Ent. Syst. Suppl. p. 430 (1798).
Lycæna pandia, Kollar, Hügel's Kasch. iv. p. 418.

POLYOMMATUS BÆTICUS.

Papilio bæticus, Linn. Syst. Nat. i. 2, p. 789 (1767).

LAMPIDES ÆLIANUS.

Hesperia ælianus, Fabr. Ent. Syst. iii. p. 280 (1793).

LYCÆNA NAZIRA.

Polyommatus nazira, Moore, P. Z. S. 1865, p. 504, pl. 31. f. 4.

LYCÆNA ARIANA.

Polyommatus ariana, Moore, P. Z. S. 1865, p. 504, pl. 31. f. 2.

LYCÆNA SUTLEJA, n. sp.

Near to *L. boisduvalii* and *L. ariana*. Upperside darker glossy blue, the marginal band narrower; no dusky streaks ascending the veins; the marginal spots on hind wing less prominent. Underside lilacine ochreous-grey, darkest on hind wing; markings similar to *L. boisduvalii*, except that the spot within the cell is further from the discocellular lunule, this spot being situated inward of the end of lower median vein; the discal row of spots are more linearly disposed, the marginal spots having their red inner borders more slenderly black-lined; hind wing with a black centre to the discocellular lunule: upper discal spots nearer together, thus giving a wider space between the upper one and basal spot; the red borders to marginal spots are somewhat broader and more slenderly black-streaked.

Expanse $1\frac{4}{10}$ inch.

Hab. Kangra district. In coll. British Musenm.

LYCÆNA METALLICA.

Lycæna metallica, Felder, Reise Novara, Lep. ii. p. 283, pl. 35. f. 7, 8 (1865), ♂.

LYCÆNA OMPHISA.

Polyommatus omphisa, Moore, P. Z. S. 1874, p. 573, pl. 66. f. 2.

Taken in Ladak.

CHRYSOPHANUS PHLŒAS.

Papilio phlœas, Linn. Syst. Nat. i. 2, p. 793 (1767).

CHRYSOPHANUS KASYAPA.

Chrysophanus kasyapa, Moore, P. Z. S. 1865, p. 506, pl. 31. f. 10.

CHRYSOPHANUS PAVANA.

Thecla pavana, Kollar, Hügel's Kaschmir, iv. p. 416, pl. 5. f. 5, 6 (1844).

Thecla panava, Westw. Gen. D. Lep. p. 487 (1852).

THECLA SYLA.

Thecla syla, Kollar, Hügel's Kaschmir, iv. p. 414, pl. 4. f. 7, 8 (1844).

Dipsas sila, Hewits. Ill. D. Lep. pl. 26. f. 3.

THECLA ATAXAS.

Dipsas ataxas, Doubleday & Hewits. Gen. D. Lep. pl. 74. f. 7 (1852); Hewits. Ill. D. Lep. pl. 26. f. 6.

THECLA ODATA.

Dipsas odata, Hewits. Ill. D. Lep. p. 66, pl. 30. f. 13, 14 (1865); Moore, P. Z. S. 1865, p. 507.

THECLA BIRUPA.

Dipsas birupa, Moore, Ann. & Mag. Nat. Hist. 1877, xx. p. 51.

HORAGA ONYX.

Thecla onyx, Moore, Catal. Lep. Mus. E.I. C. i. p. 30, ♂ (1857).

Male. Violet-brown; fore wing with the lower basal and discal area cyaneous blue; discal white spot large, of the same size as in female *H. viola*; hind wing paler, the medial area cyaneous blue. Underside pale olivaceous brownish-ochreous, the discal band on fore

ILERDA ODA.

Ilerda oda, Hewits. Ill. D. Lep. p. 58, pl. 24. f. 9, 10.

ILERDA SENA.

Polyommatus sena, Kollar, Hügel's Kaschm. iv. p. 415, pl. 5. f. 3, 4 (1844).

IRAOTA TIMOLEON.

Papilio timoleon, Stoll, Suppl. Cram. Pap. Exot. v. pl. 32. f. 4 (1790).

HYPOLYCÆNA MILIONIA.

Myrina mylionia, Hewits. Ill. D. Lep. Suppl. p. 5, pl. 3. f. 79, 80 (1869).

"9000 feet."

HYPOLYCÆNA NASAKA.

Thecla nasaka, Horsf. Catal. Lep. Mus. E.I.C. (1829), p. 91.

Identical with Javan type.

HYPOLYCÆNA CHANDRANA, n. sp. (Plate XI. figs. 2, 2 *a*.)

Allied to *H. nasaka*. *Male*. Upperside violet-brown: fore wing with the lower basal and discal area dull violet-blue, and the medial area of hind wing purplish violet-blue; marginal line and anal lobe black. Cilia whitish.

Underside olive-grey: fore wing with a broad discocellular slender black-lined white-bordered streak, a similar broken discal band, and a similar marginal narrower lunular band: hind wing with a similar discocellular streak, a discal band, which is broken beyond the cell and bent upwards above anal angle, and a marginal dentated band ending in a large red spot and anal lobe and an intervening streak, the spot and anal lobe black-centred, the streak with metallic-green borders; a white-bordered black spot on costa near the base, another at end of the cell, and a less distinct spot above anal angle.

Expanse $1\frac{1}{8}$ inch.

Hab. Lahul. In coll. British Museum.

NADISEPA, n. g.

Allied to *Deudorix*. Fore wing more acuminate at the apex; male furnished with a tuft of hair on middle of posterior margin: hind wing more attenuated hindward; exterior margin slightly sinuous; a broad conical depressed glandular spot between the costal and subcostal veins. Venation similar. Palpi smaller, shorter, second joint of more equal width; antennal club shorter.

NADISEPA JARBAS.

Papilio jarbas, Fabr. Mant. Ins. ii. p. 68 (1787).

Thecla jarbas, Horsf. Catal. Lep. Mus. E.I.C. (1829), p. 93.

BASPA, n. g.

Differs from typical *Deudorix* (*D. epijarbas*). *Male* with a l[illegible] triangular form of fore wing; the hind wing more oblique on cost[illegible] and exterior margins, the apex very convex. Venation simil[illegible]. *Female*: fore wing more triangular: hind wing narrower and l[illegible] convex. Second joint of palpi much shorter; antennal club mu[illegible]ch shorter and abruptly formed. Sexes alike in colour.

BASPA MELAMPUS.

Papilio melampus, Cram. Pap. Exot. iv. pl. 362. f. G, H (178[illegible]2).
Thecla sorya, Kollar, Hügel's Kasch. iv. p. 414, pl. 5. f. 1, [illegible], 2 (1844).

DEUDORIX EPIJARBAS.

Dipsas epijarbas, Moore, Catal. Lep. Mus. E.I.C. i. p. 32 (1857[illegible]7).
Deudorix epijarbas, Hewits. Ill. D. Lep. pl. 7. f. 16–18.

VIRACHOLA PERSE.

Deudorix perse, Hewits. Ill. D. Lep. p. 18, pl. 8. f. 24–26 (1863[illegible]).

VIRACHOLA ISOCRATES.

Hesperia isocrates, Fabr. Ent. Syst. iii. p. 266 (1793), ♂.
Thecla isocrates, Westw. Tr. Ent. Soc. 1836, p. 4, pl. 1.

BIDASPA, n. g.

Nearest to *Virachola*. Fore wing comparatively more triangular; third subcostal emitted at a slight angle before end of the cell: hind wing less produced hindward; costal margin longer, apex less convex; cell triangular; first subcostal emitted at one fifth before end of the cell; the broad conical depressed glandular spot terminates before reaching the first subcostal branch, and does not extend below into the cell; tail slender. Palpi less compactly squamose; antennal club shorter.

Type *B. nissa*.

BIDASPA NISSA.

Thecla nissa, Kollar, Hügel's Kaschmir, iv. p. 412, pl. 4. f. 3, 4 (1844).
Deudorix nissa, Hewits. Ill. D. Lep. p. 23, pl. 10. f. 42, 43 (nec f. 44).

HYSUDRA, n. g.

Allied to *Bidaspa*. Fore wing less triangular in form, the exterior margin slightly convex; no tuft on posterior margin of male: hind wing less produced hindward; no costal depressed granular spot; tail shorter.

HYSUDRA SELIRA.

Deudorix selira, Moore, P. Z. S. 1874, p. 272.
Deudorix nissa, Hewits. Ill. D. Lep. pl. 10. f. 44 (nec Kollar).

RAPALA GRISEA.

Deudorix grisea, Moore, P. Z. S. 1879, p. 140.

APHNÆUS ETOLUS.

Papilio etolus, Cram. Pap. Exot. iii. pl. 208. f. E, F (1782).

APHNÆUS TRIFURCATA, n. sp.

Male. Upperside violet-brown; basal area of a more greyish-blue tint than in *A. ictis*, the orange spot trifurcate and triangular.

Female paler; basal area greyish vinous-brown; orange spot on fore wing small, not larger than that of the male. Underside of a deeper chrome-yellow, the silver-streaked bands similarly disposed, but all nearly dusky black throughout their breadth; the marginal slender spots more prominent.

Expanse, ♂ 1$\frac{3}{10}$, ♀ 1$\frac{5}{10}$ inch.

Hab. N.W. Himalaya, Dharmsala (*Baden Powell* and *Hocking*). In coll. F. Moore and British Museum.

APHNÆUS UNIFORMIS, n. sp.

Fore wing comparatively narrower and more acutely pointed at the apex than in *A. trifurcata*; hind wing shorter, but longer hindwards, and the exterior margin even and less convex anteriorly. Upperside dull bluish brown: fore wing unmarked: hind wing with an indistinct dull ochreous anal spot speckled with grey and black. Underside dull pale brownish ochreous, the transverse bands nearly obsolete, being indicated by very slender indistinct silvery-speckled lines; anal lobe black-spotted.

Expanse 1$\frac{5}{12}$ inch.

Hab. Mount Meru, Wurdhan. In coll. British Museum.

APHNÆUS ELIMA.

Aphnæus elima, Moore, Ann. & Mag. Nat. Hist. 1877, p. 51.

PRATAPA ICETAS.

Iolaus icetas, Hewits. Ill. D. Lep. p. 44, pl. 18. f. 6, 7 (1865), ♀.

LOXURA ATYMNUS.

Papilio atymnus, Cram. Pap. Exot. iv. pl. 331. f. D, E (1782).

SURENDRA QUERCETORUM.

Amblypodia quercetorum, Moore, Catal. Lep. Mus. E.I.C. i. p. 42, pl. 1 *a*. f. 7 (1857).

PANCHALA, n. g.

Wings small, short, broad: fore wing much arched; exterior margin erect, slightly convex hindwards; cell extending beyond half the wing; costal vein extending to near half the margin; first subcostal emitted at two fifths and second at one fifth before end of the cell, third bifid at one third before the apex, fifth from slight angle at end of the cell; discocellular slightly bent near upper end, radial from the angle; middle median near end of the cell, lower at one fourth before the end, curved downwards; submedian straight: hind wing very convex externally; costa much recurved from the base, apex angular; costal vein recurved, extending to the apex; first subcostal emitted at one third before end of the cell; discocellular slightly bent in the middle, radial from the angle; two upper medians from end of the cell, lower at one fourth before the end; submedian straight, internal recurved. Body short, thorax moderate; palpi porrect, compactly squamose, second joint projecting half its length beyond the head, third joint one third its length, slender; legs compactly squamose; antennæ short, thickening to the apex.

Type *P. ganesa.*

PANCHALA GANESA.

Amblypodia ganesa, Moore, Catal. Lep. Mus. E.I. C. i. p. 44, pl. 1 *a.* f. 8 (1857).

PANCHALA DODONEA.

Amblypodia dodonea, Moore, Catal. Lep. Mus. E.I. C. i. p. 43, pl. 1 *a.* f. 8 (1857).

PANCHALA RAMA.

Thecla rama, Kollar, Hügel's Kasch. iv. p. 412, pl. 4. f. 1, 2 (1844).

PAPILIONIDÆ.

PIERINÆ.

TERIAS HECABE.

Papilio hecabe, Linn. Syst. Nat. i. 2, p. 763 (1767).

TERIAS EXCAVATA, n. sp.

Near *T. hecabe.* Fore wing with the marginal band of a similar form but not quite so wide, the lower portion extending less from the angle: hind wing with a marginal slender dentated line. *Female.* Fore wing with a slightly wider marginal band; hind wing with a very slender marginal dentated line. Underside with pale markings; the apical streak pale in the male, prominent in the female.

Expanse $1\frac{5}{8}$ inch.

Hab. Kangra district (Dharmsala). In coll. British Museum and F. Moore.

TERIAS PURREEA, n. sp.

Allied to *T. æsiope.* Smaller in size; the marginal band on fore wing one third less in width at upper and lower ends, the upper and lower angles of the excavated portion less acute: hind wing with a slight marginal dentated line. Underside with similar but narrower and smaller markings.

Expanse $1\frac{5}{8}$ to $1\frac{6}{8}$ inch.

Hab. Kangra distirct. In coll. British Museum.

TERIAS IRREGULARIS, n. sp. (Plate XII. fig. 3.)

Near to *T. fimbriata*. Wings comparatively shorter; of the same tint of colour: fore wing with the marginal band broadly oblique at the apex, excavated in the middle, and sinuous at posterior end: hind wing with a marginal slender dentated line. *Female* paler, the marginal band on fore wing with sharper angles; minute marginal dentated spots on hind wing. Underside with very prominent chestnut-brown markings.

Expanse $1\frac{7}{10}$ inch.

Hab. Kangra district. In coll. British Museum.

TERIAS FIMBRIATA.

Terias fimbriata, Wallace, Trans. Ent. Soc. 1867, p. 323.

TERIAS APICALIS, n. sp. (Plate XII. fig. 2.)

Also allied to *T. fimbriata*. Wings narrower and paler: fore wing with the marginal band confined to a narrow apical costal streak, the lower portion from the subcostal vein composed of very small speckled spots: hind wing with a marginal row of minute spots. *Female* with the band broader at the apex, the lower part as in male. Underside with distinct chestnut-brown markings.

Expanse $1\frac{4}{8}$ inch.

Hab. Kangra district. In coll. British Museum.

TERIAS DRONA.

Terias drona, Horsf. Catal. Lep. Mus. E.I.C. (1829), p. 137, pl. f. 13.

TERIAS RUBELLA.

Terias rubella, Wallace, Trans. Ent. Soc. 1867, p. 323.

CATOPSILIA CROCALE.

Papilio crocale, Cram. Pap. Exot. i. pl. 55. f. C, D (1755), ♀.
Papilio alcmeone, Cram. loc. cit. ii. pl. 141. f. E, ♂.

"Kulu. June to August. Both the narrow- and broad-bordered females taken at same time."

CATOPSILIA GNOMA.

Papilio gnoma, Fabr. Syst. Ent. App. p. 828 (1775), ♂.
Papilio philippina, Cram. P. Ex. iv. pl. 361. f. C, D (1781), ♀.

"Kangra valley generally. June to August. Affects flowers, *Zinnia* particularly."

CATOPSILIA PYRANTHE.

Papilio pyranthe, Linn. Syst. Nat. ii. p. 763 (1767).

GONEPTERYX NEPALENSIS.

Gonepteryx nepalensis, Doubleday, Gen. D. L. p. 71 (1847).
Gonepteryx rhamni, Gray, Lep. Ins. Nepal, pl. 5. f. 1 (1866).

end, radial from the angle; middle me
lower at one fourth before the end, c
straight: hind wing very convex c … *fist.* 1
from the base, apex angular; cost … *f.* l.)
apex; first subcostal emitted a
discocellular slightly bent in th … a slightly
upper medians from end of … end, the red
end; submedian straight, … leaving a
moderate; palpi porrect. … Underside s
ing half its length beyo
slender; legs compac … British Museum.
the apex.

Type *P. ganesa*

PANCHALA GA … 1860, p. 151, pl. 15.
Amblypodia … given for this species
pl. 1 a. f. 8 (

PANCHAL
Amblyp … Pap. Exot. iii. pl. 217. f
pl. 1 a. f.

PANC … CALLERCBUS …
Thec … Butler, P. Z. S. 1876, p. 159
(1844)

CALLERCBUS PURA.
… pura, Butler, P. Z. S. 1876, p. 160, p

T … COLIAS LADAKENSIS.
J … *Colias ladakensis*, Felder, Reise Novara, Lep. ii
f. 8, 9 (1865).
Colias …, Moore, P. Z. S. 1865, p. 492, pl.
"… Pass."

COLIAS FIELDI.
Colias fieldii, Ménétr. Catal. Mus. Petr. Lep. i.
(1855).
C. edusa, Gray, Lep. Ins. Nepal, pl. 5. f. 2.

COLIAS SAREPTENSIS?
? *Colias sareptensis*, Staudinger, Catal. p. 4 (187
Colias (? *sareptensis*). "Occurs all the year r
Dharmsala in grassy fields from April to November,
the valley early in March. The yellow and white
the same time and place, and taken *in copulâ*."

COLIAS PALLIDA?
? *Colias pallida*, Staudinger, Catal. p. 4 (1871).
[1] *Ixias dharmsalæ*, Butler, described as having been colle
by Dr. Watt, is not represented in Mr. Hocking's collection.

IXIAS KAUSALA.

Ixias kausala, Moore, Ann. & Mag. Nat. Hist. 1877, p. 49.

IXIAS PYGMÆA, n. sp. (Plate XII. fig. 1.)

Nearest to *I. kausala*. Smaller, and of a slightly paler yellow: fore wing with a broader black apical band, the red belt being much narrower and more irregularly bordered, leaving a much broader black inner space: hind wing unmarked. Underside similarly marked to *I. kausala*.

Expanse 1⅝ inch.

Hab. Kangra district. In coll. British Museum.

IXIAS WATTI[1].

Ixias watti, Butler, P. Z. S. 1880, p. 151, pl. 15. f. 1, ♂.

The locality of "Bengal" given for this species is evidently an error.

IXIAS MARIANNE.

Papilio marianne, Cram. Pap. Exot. iii. pl. 217. f. C–E (1782).

CALLOSUNE FARRINA.

Teracolus farrinus, Butler, P. Z. S. 1876, p. 159, pl. 7. f. 2.

CALLOSUNE PURA.

Teracolus purus, Butler, P. Z. S. 1876, p. 160, pl. 7. f. 14, 15.

COLIAS LADAKENSIS.

Colias ladakensis, Felder, Reise Novara, Lep. ii. p. 197, pl. 27. f. 8, 9 (1865).

Colias shipkee, Moore, P. Z. S. 1865, p. 492, pl. 31. f. 13.

"Baralacha Pass."

COLIAS FIELDI.

Colias fieldii, Ménétr. Catal. Mus. Petr. Lep. i. p. 79, pl. 1. f. 5 (1855).

C. edusa, Gray, Lep. Ins. Nepal, pl. 5. f. 2.

COLIAS SAREPTENSIS?

? *Colias sareptensis*, Staudinger, Catal. p. 4 (1871).

Colias (? *sareptensis*). "Occurs all the year round; found at Dharmsala in grassy fields from April to November, and lower down the valley early in March. The yellow and white forms found at the same time and place, and taken *in copulâ*."

COLIAS PALLIDA?

? *Colias pallida*, Staudinger, Catal. p. 4 (1871).

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[1] *Ixias dharmsalæ*, Butler, described as having been collected at Dharmsala by Dr. Watt, is not represented in Mr. Hocking's collection.

COLIAS ERATE ?.

? *Papilio erate*, Esper, Ausl. Schmett. i. 2. pl. 119. f. 3.

Male. Clear yellow: fore wing with the marginal band of a similar form to that in *C. edusa* and *C. fieldi*, unspotted, of a cuprescent-brown colour, and of the same width except at the apex, where it is broader owing to the more pointed form of wing; the band also has the curvature of its inner border as in those species, and its upper end with distinct streaks extending for a short distance along the anterior veins: hind wing with the band and discal spots similar to those in European *C. erate*. Underside paler than in *C. erate*; discal spots less distinct, the discoidal spot on fore wing entirely black, that on hind wing large with whitish centre and lobate red border.

Expanse 2 inches.

This has the apex of the fore wing more prolonged than in European *C. erate*, the angle more acute, and the exterior margin more oblique.

COLIAS LATIVITTA, n. sp.

Male. Yellow: fore wing with a broad unspotted blackish band, the inner border of which is angulated inward at the upper median vein; the band very sparsely yellow-speckled on the anterior veins; discocellular spot large, black: hind wing with a broad blackish crenulated band and a large orange-yellow discocellular spot. Underside olivaceous yellow: fore wing with a black discocellular spot and a distinct discal row of spots: hind wing with a moderate-sized dull pearly-white red-bordered discocellular spot.

Female. Yellow, or white; the band on fore wing broader than in male, and with not very prominent upper and lower yellow spots; the discocellular spot distinct: hind wing darker, with broad marginal band traversed inwardly by large ill-defined yellow spots; discocellular spot brighter red.

Expanse $1\frac{5}{8}$ to $2\frac{2}{8}$ inches.

Hab. Nepal (type); Kunawar; Kangra (*Hocking*). Cashmere (*Hellard*). In coll. F. Moore and British Museum.

The colour in this species is of a deeper yellow, and the bands on both wings are conspicuously broader than in the preceding (*C. pallida*) or S.-Russian specimens of *C. erate*.

HUPHINA PHRYNE.

Papilio phryne, Fabr. Syst. Ent. p. 473 (1775).
Papilio evagete, Cram. Pap. Exot. iii. pl. 221. f. F, G.

BELENOIS MESENTINA.

Papilio mesentina, Cram. Pap. Exot. iii. pl. 270. f. A, B (1782).

SYNCHLOË DAPLIDICE.

Papilio daplidice, Linn. Syst. Nat. i. 2, p. 760 (1767).

SYNCHLOË CALLIDICE.

Papilio callidice, Esper, Schmett. i. 2, pl. 115. f. 2, 3 (1800).
Pieris kalora, Moore, P. Z. S. 1865, p. 489, pl. 31. f. 15.

SYNCHLOË BUTLERI, n. sp. (Plate XI. figs. 6, 6 *a*.)

Synchloë butleri, Hocking, MS.

Near to *S. callidice*. Upperside—basal area of both wings deeply black-speckled: fore wing with a narrow black discocellular spot, shorter subapical streak, and more distinctly-formed marginal spots: hind wing with an interrupted black discocellular streak, and an exceedingly indistinct blackish-speckled anterior discal fascia. Underside—fore wing with the costal border and apex pale reddish ochreous; discocellular spot and apical streaks black: hind wing pale reddish ochreous, with black streaks bordering all the veins, the streaks interrupted across the disk.

Expanse 1⅝ inch.

Hab. Lahoul. In coll. British Museum.

DELIAS EUCHARIS.

Papilio eucharis, Drury, Ill. Exot. Ins. ii. pl. 10. f. 5, 6 (1773); Cram. Pap. Exot. iii. pl. 201. f. B, C, pl. 202. f. C.

DELIAS SANACA.

Pieris sanaca, Moore, Catal. Lep. Mus. E.I.C. i. p. 79 (1857); P. Z. S. 1857, p. 103, pl. 44. f. 4.

MANCIPIUM NEPALENSE.

Pieris nepalensis, Gray, Lep. Nepal, pl. 6. f. 3 (1846).

"Larvæ May 5 reared from eggs found on the *Nasturtium*. Imagines came out May 25. Two or three broods in the year. Common."

MANCIPIUM CANIDIA.

Pieris canidia, Sparrm. Amœn. Acad. vii. p. 504 (1768).
Papilio gliciria, Cram. Pap. Exot. ii. pl. 171. f. E, F (1779).

APORIA SORACTA. (Plate XI. fig. 5, larva.)

Aporia soracta, Moore, Catal. Lep. Mus. E.I. C. i. p. 83 (1857).

"Larvæ found on kusmul April 6, went to pupa May 8; all victims of Ichneumons. Others also found in the same month the following year."

APORIA NABELLICA.

Pieris nabellica, Boisd. Spec. Gén. Lép. i. p. 509 (1836).

METAPORIA PHRYXE.

Pieris phryxe, Boisd. Spec. Gén. Lép. i. p. 446 (1836); Jacquem. Voy. Inde, iv. Ins. p. 16, pl. 2. f. 1 (1844), ♀.

METAPORIA CAPHUSA.

Metaporia caphusa, Moore, P. Z. S. 1872, p. 564.

PAPILIONINÆ.

PARNASSIUS HARDWICKI.

Parnassius hardwicki, Gray, Zool. Misc. p. 32 (1831); Lep. Ins. Nepal, p. 7, pl. 4. f. 1, 1*a*; Catal. Lep. Ins. Brit. Mus. p. 76, pl. 12. f. 8.

P. jacquemontii, Kollar, Hügel's Kasch. iv. p. 407, pl. 2. f. 3, 4 (nec Boisd.).

"March. Flies over the snow; 8000 feet. Sixteen specimens taken in one day, all males but one."

PARNASSIUS JACQUEMONTI.

Parnassius jacquemonti, Boisd. Spec. Gén. Lép. i. p. 400 (1836); Blanchard, Jacq. Voy. Inde, iv. Ins. p. 16, pl. 1. f. 3, 4; Gray, Catal. Lep. Ins. B. M. pl. 12. f. 1, 2.

"Head of the Kullu valley, and slopes of the Rhotang Pass; 10,000 up to 13,000 feet."

PARNASSIUS CHARLTONIUS.

Parnassius charltonius, Gray, Catal. Lep. Ins. B. M. p. 77, pl. 12. f. 7, ♂ (1852); Moore, Yarkand Mission, Lep. p. 5, pl. 1. f. 3, ♀.

"Baralacha Pass, 18,000 feet, June. Very rare."

PARNASSIUS CHARINO.

Parnassius charino, Gray, Catal. Lep. Ins. B. M. p. 76, pl. 12. f. 12 (1852).

"Top of the Rhotang Pass, 13,000 feet. Very rare."

DALCHINA SARPEDON.

Papilio sarpedon, Linn. Syst. Nat. i. 2, p. 747; Esper, Ausl. Schmett. pl. 8. f. 2.

"Flies round and round the tops of trees."

DALCHINA CLOANTHUS.

Papilio cloanthus, Westw. Arcana Ent. i. pl. 11. f. 2 (1841); Kollar, Hügel's Kasch. iv. p. 405, pl. 2. f. 1, 2.

ZETIDES AXION.

Papilio axion, Felder, Verh. zool.-bot. Gesch. 1864, pp. 305, 350.

P. eurypilus, Hübn. Samml. ex. Schmett. ii. pl. 107 (nec Linn.).

Near to *Z. telephus*. Underside—fore wing with the discoidal spots larger, the two at the end confluent; medial transverse band wider posteriorly and less divided by the veins; the marginal row of spots narrower and more lunular in form, the upper being wider apart: hind wing with a broader medial band, the subbasal costal red-banded streak narrower; two short black spots divided by a red lunule within the end of the cell, the other red-lunulated spots

SAINIA, n. g.

Fore wing comparatively narrower than in *Iliades* (*memnon* group); costa more arched; apex very convex; exterior margin very oblique and slightly sinuous; posterior angle somewhat pointed. Hind wing narrow, elongated hindward; costa very short; exterior margin moderately scalloped; the female of typical species without a tail; cell longer than in *Iliades*.

SAINIA PROTENOR.

Papilio protenor, Cram. Pap. Exot. i. pl. 49. f. A, B (1779).

CADUGOÏDES, n. g.

Fore wing elongated, triangular; costa arched towards the end, apex convex; exterior margin oblique, even, and concave in the middle, posterior angle rounded; cell very long, extending two thirds the wing; upper discocellular outwardly oblique, lower inwardly oblique and concave: hind wing fan-shaped; the costal margin very long, extending beyond posterior angle of fore wing, apex abruptly convex; exterior margin short, very oblique and slightly scalloped; abdominal margin somewhat long. Antennæ short, slender, club moderately and gradually thickened to tip.

Type *C. agestor*.

A mimic, in both general form and pattern, of *Caduga tytia*, of the *Euplœinæ*.

CADUGOÏDES AGESTOR.

Papilio agestor, Gray, Zool. Misc. p. 32 (1831); Lep. Ins. Nepal, p. 6, pl. 4. f. 2.

CADUGOÏDES GOPALA, n. sp.

Papilio agestor, Westwood, Arcana Ent. p. 59, pl. 16. f. 2 (nec Gray).

Female. Intermediate between *C. agestor* and *C. govindra*: fore wing with similar markings to those of the same sex, except that the three submarginal spots are more conical in shape and concave on their outer edge than in either of the above species, the marginal row of small spots being like those in *C. agestor*: hind wing less produced apically, the exterior margin more convex and more prominently scalloped than in female *C. agestor*, the red colour of a considerably paler tint than in either species, being somewhat yellowish towards the base and along the outer veins, the veins basally and the discoidal streaks are black-lined; the intermediate streaks of similar form to those in *C. agestor*, but of an ochreous-grey tint; the discal series with slight blackish outer ends, and an outer marginal series of large blackish conical spots. Body as in *C. agestor*.

Expanse 4 inches.

Hab. Kangra district. In coll. British Museum.

Cadugoïdes govindra.

Papilio govindra, Moore, Ent. Monthly Mag. i. p. 101 (1864); P. Z. S. 1865, p. 486.

Papilio agestor, Kollar, Hügel's Kasch. iv. pl. 3. f. 1, 2 (nec Gray).

Chilasa dissimilis.

Papilio dissimilis, Linn. Syst. Nat. i. 2, p. 782 (1767); Clerck, Icones, pl. 16. f. 2.

"Flight very strong."

Chilasa panope.

Papilio panope, Linn. Syst. Nat. i. 2, p. 782 (1767); Cram. Pap. Exot. iv. pl. 295. f. E, F.

HESPERIIDÆ.

Badamia exclamationis.

Papilio exclamationis, Fabr. Syst. Ent. p. 530 (1775).
Papilio ladon, Cram. Pap. Exot. iii. pl. 284. f. C, ♀.

Ismene œdipodea.

Ismene œdipodea, Swains. Zool. Illustr. i. pl. 16 (1820–21).

Choaspes benjamini.

Thymele benjamini, Guér. Deless. Voy. Inde, ii. pl. 22. f. 2, 2 *a* (1843).

Parnara mangala.

Hesperia mangala, Moore, P. Z. S. 1865, p. 792.

Suastus gremius.

Hesperia gremius, Fabr. (Butler, Catal. Fabr. Lep. B. M. p. 271, pl. 3. f. 7, ♀).
Hesperia divodasa, Moore, Catal. Lep. Mus. E.I. C. i. p. 255.

Suastus eltola.

Hesperia eltola, Hewits. Exot. Butt. iv. *Hesp.* pl. 4. f. 40 (1869).

Chapra mathias.

Hesperia mathias, Fabr. (Butler, Catal. Fabr. Lep. B. M. p. 275, pl. 3. f. 8, ♂).

Chapra prominens, n. sp.

Male and female. Upperside dark olive-brown, basal area brighter olive. *Male*—fore wing with eight rather large quadrate yellowish semidiaphanous spots, three being disposed before the apex, three discal, and two very obliquely at end of the cell; a prominent narrow oblique yellow brand or streak below the cell, which in the female is replaced by two spots, the upper one of which is very small: hind wing with four yellow semidiaphanous contiguous spots. Underside paler; spots on fore wing as above, the brand showing as a diffused yellow patch from its outer edge; the series of spots on hind wing more prominently white, with a fifth spot at the upper end, and one also at the upper end of the cell.

Expanse 1⅝ inch.

Hab. N.W. Himalaya: Tonse valley, 6000 feet; Gurwhal (*Lang*); Kussowlee; Kangra. In coll. F. Moore, Major Lang, and and British Museum.

An allied species to this, from Shanghai, N. China, has recently been described by Mons. Mabille as *Gegenes sinensis* (Bull. Soc. Zool. de France, 1877, p. 232), from which the above differs in its somewhat broader wings and larger size of the markings on the fore wing.

PADRAONA DARA.

Hesperia dara, Kollar, Hügel's Kasch. iv. p. 455 (1844).
Pamphila mæsa, Moore, P. Z. S. 1865, p. 509, pl. 30. f. 9.

AMPITTIA MARO.

Hesperia maro, Fabr. (Butler, Catal. Fabr. Lep. B. M. p. 279, pl. 2. f. 12, ♂).

TARACTROCERA SAGARA.

Pamphila sagara, Moore, P. Z. S. 1865, p. 792.

THANAOS STIGMATA.

Thanaos stigmata, Moore, P. Z. S. 1878, p. 694.

ISOTEINON MASURIENSIS.

Isoteinon masuriensis, Moore, P. Z. S. 1878, p. 693, pl. 45. f. 3.

HYAROTIS ADRASTUS.

Hesperia adrastus, Cram. Pap. Exot. iv. pl 319, f. F, G (178[illegible]
Plesioneura praba, Moore, P. Z. S. 1865, p. 790.
Hesp. phœnicis, Hewits. Ex. Butt. *Hesp.* pl. 4. f. 36, 37 (1869

TAGIADES MENAKA.

Pterygospidea menaka, Moore, P. Z. S. 1865, p. 778.

SARANGESA PURENDRA.

Pyrgus purendra, Moore, Catal. Lep. Mus. E.I. C. i. p. 250.

Upperside greyer than in *S. dasahara*, with paler mottled markings: fore wing with a semidiaphanous white continuous streak across the cell near its end, a continuous small spot above it, three small conjoined spots before the apex, and three on the disk, the middle discal spot large and quadrate. Cilia alternated with grey. Underside paler: fore wing marked as above, and with an additional small white lower spot on the disk, and a basal streak below the cell; hind wing with a small whitish spot in middle of the cell, and a less distinct discal curved series.

Expanse 1¼ inch.

wing with four yellow semidiaphanous contiguous spots. Undersi[illegible]e paler: spots on fore wing as above, the brand showing as a diffus[illegible]ed yellow patch from its upper edge: the series of spots on hind wi[illegible]ng more prominently white, with a fifth spot at the upper end, and [illegible]ne also at the upper end of the cell.

Expanse [illegible] inch.

Hab. N.W. Himalaya: Tonse valley, 6000 feet; Gurw[illegible]hal (*Lang*): Kussowlee: Kangra. In coll. F. Moore, Major Lang, [illegible]nd and British Museum.

An allied species to this, from Shanghai, N. China, has recen[illegible]tly been described by Mons. Mabille as *Gegenes sinensis* (Bull. S[illegible]oc. Zool. de France, 1877, p. 232), from which the above differs in its [illegible] the somewhat broader wings and larger size of the markings on t[illegible] fore wing.

PADRAONA DARA.

Hesperia dara. Kollar, Hügel's Kasch. iv. p. 455 (1844).
Pamphila mæsa, Moore. P. Z. S. 1865, p. 509, pl. 30. f. 9.

AMPITTIA MARO.

Hesperia maro, Fabr. (Butler, Catal. Fabr. Lep. B. M. p. 279, [illegible]9, pl. 2. f. 12, ♂).

TARACTROCERA SAGARA.

Pamphila sagara, Moore, P. Z. S. 1865, p. 792.

THANAOS STIGMATA.

Thanaos stigmata, Moore, P. Z. S. 1878, p. 694.

ISOTEINON MASURIENSIS.

Isoteinon masuriensis, Moore, P. Z. S. 1878, p. 693, pl. 45. f. 3.

HYAROTIS ADRASTUS.

Hesperia adrastus, Cram. Pap. Exot. iv. pl 319, f. F, G (1780).
Plesioneura praba, Moore, P. Z. S. 1865, p. 790.
Hesp. phœnicis, Hewits. Ex. Butt. *Hesp.* pl. 4. f. 36, 37 (1869).

TAGIADES MENAKA.

Pterygospidea menaka, Moore, P. Z. S. 1865, p. 778.

SARANGESA PURENDRA.

Pyrgus purendra, Moore, Catal. Lep. Mus. E.I. C. i. p. 250.

Upperside greyer than in *S. dasahara*, with paler mottled markings: fore wing with a semidiaphanous white continuous streak across the cell near its end, a continuous small spot above it, three small conjoined spots before the apex, and three on the disk, the middle discal spot large and quadrate. Cilia alternated with grey. Underside paler: fore wing marked as above, and with an additional small white lower spot on the disk, and a basal streak below the cell: hind wing with a small whitish spot in middle of the cell, and a less distinct discal curved series.

Expanse 1¼ inch.

2. Notes on a South-American Frog lately living in the Society's Gardens. By G. A. Boulenger, C.M.Z.S.

[Received January 30, 1882.]

(Plate XIII.).

The small Frog (*Phyllomedusa hypochondrialis*) which is the subject of this communication lived but a few days in the Society's Gardens. It had been obtained at Pernambuco by Dr. Stradling; and was, I believe, the first specimen of this species that has reaches Europe alive.

In spite of its small size (34 millim. from snout to vent), it is nearly adult, the species to which it belongs never growing to a size superior to that of the common Tree-frog of Europe; whilst *Phyllomedusa bicolor*, of which *P. hypochondrialis* has frequently been regarded as the young, reaches the largest size which any member of the family Hylidæ attains, viz. 130 millim. from snout to vent.

It is not necessary to enter into details concerning the structural characters of this animal, as these will be found in my 'Catalogue of the Batrachia Ecaudata in the British Museum' (p. 434), where thirteen species of *Phyllomedusa* are distinguished; but I think it well to state that the inner toe only is opposable to the others, as has been figured by Burmeister in another species of the same genus, and not the two inner toes, as believed by many authors.

The point of interest in the specimen, which I had the pleasure of observing alive, is the coloration. This is very different from that of spirit-specimens, and quite worthy of notice, as it does not appear to have been recorded before.

When the animal sits half asleep on a leaf or against the glass of its case, the limbs folded against the body, as most Tree-frogs are in the habit of doing during the daytime, it is entirely of a light, rather faded green, without any markings. But when it stretches out its limbs, the aspect is very different, all the concealed surfaces, viz. the upper surface of the humerus, the two inner fingers, the flanks, the lateral and upper surfaces of the femur with the exception of a narrow green streak (the only part of the femur seen when the limbs are folded), the inner side of the tarsus and the three inner toes, being of a bright orange-colour, elegantly marked with transverse purplish-black bars.

The upper lip has a very narrow white margin. A fine blackish line extends from the angle of the mouth to the middle of the side, separated by a white streak from the green of the back. Another blackish line round the lower lip; another, white-margined, along the outer edge of the forearm and fourth finger, and tarsus and fifth toe.

The lower surfaces are pure white, with the exception of the tibiæ, which are orange.

The iris is silvery white, as has been figured by Burmeister in *Phyllomedusa burmeisteri*.

rounded, occupying nearly the whole of the fore part of the sole. First hind toe reaching just to the base of the second; fifth to the end of the metacarpal of the fourth.

Molars much as in the subgenus *Isomys*, broad and rounded, with numerous small but well-marked cusps.

Approximate dimensions, in inches:—

Head and body.	Tail.	Hind foot.	Forearm and hand.	Ear-conch.	Skull.	Incisors to 1st upper molars.	Molar series.
6·2	5·8	1·01	1·18	0·65	—	·38	·21

Judging from the analogy of other species, I should imagine that *Mus nigricauda* is an arboreal animal; for in nearly all climbing Rodents we find the rather short feet, large rounded foot-pads, and more or less bushy tail characteristic of the present species. The Dormice, Squirrels, and, most closely analogous of all, the Climbing Vesper-mice of Tropical America (*Rhipidomys*), may be cited as examples of forms which possess the above mentioned accompaniments of an arboreal habit of life.

4. Description of the Pterylosis of *Mesites*, with Remarks on the Position of that Genus. By W. A. Forbes, B.A., Prosector to the Society.

[Received February 7, 1882.]

When making some observations on the pterylographical and other peculiarities of *Eupetes macrocercus* [1], I expressed regret at not having been able to obtain any specimen of *Mesites*, which in external appearance somewhat approaches *Eupetes macrocercus*, to study its pterylosis also.

Since then, having obtained through Herr G. Schneider, of Basel, a skin of *Mesites variegatus*, I have been able, from an examination of it, to complete our knowledge of this most peculiar form as regards the distribution of its feathers. All that was previously known of this part of the structure of *Mesites* was the existence in that bird of five pairs of powder-down patches [2], M. A. Milne-Edwards in his paper on it [3] having confined his observations to its osseous and internal structure [4]. Those interested in the various opinions which have been held by naturalists as to the exact systematic position of *Mesites*, I will refer to M. Milne-Edwards's paper just quoted, only adding Mr. E. Bartlett's suggestion "that the genus *Mesites* should be arranged in the Natural System next to *Eurypyga* and its near ally *Rhinochetus*."

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[1] P. Z. S. 1881, p. 838.

[2] Vide E. Bartlett, P. Z. S. 1877, p. 292.

[3] Ann. Sci. Nat. (6) Zool. vii. 1878, art. 6.

[4] An imperfect skull, extracted from the present skin, shows that the palate is schizognathous, the recurved maxillo-palatines being free in the middle line, and the vomer small and pointed—points not evident in Milne-Edwards's figure, his specimen, I believe, being somewhat imperfect.

The nostrils of *Mesites* are long, linear concave-upward slits, extending for more than half the length of the beak, and covered above by a well-marked membranous valvular operculum, being in this respect very unlike the ordinary form of nostril in the Rails.

The tarsi have about 10 or 11 distinct transverse scutellæ anteriorly, best developed internally, and there nearly meeting, along the lateral surface, a similar but somewhat more numerous series of smaller scutellæ, which are developed along the posterior aspect of the leg, but become obsolete about ½ inch above the metatarso-phalangeal joint. Externally the two series of scutellæ are separated by a distinct space covered by smooth, non-scutellated skin. This tarsal scutellation extends upwards above the "knee" for about ½ inch, for which extent therefore the tibia is bare of feathers.

The digits are all free from their bases; the hallux is considerably the smallest of them [1].

The number of remiges cannot be counted with certainty; but there are certainly 10 primaries; the wing is much rounded.

There are 16 rectrices, a very non-passerine character [2]; and both the upper and under tail-coverts are very long, with the last feathers rectriciform and extending along the tail for quite three fourths of its length both above and below.

There is apparently no claw on the pollex; and the contour-feathers have *no* aftershaft—in both these respects differing from the *Rallidæ*. The tail in my specimen has unfortunately been so cut that I have been unable to ascertain for certain whether the oil-gland is present or not. I can find no tuft, however; and as we know that the gland, though present, is nude both in *Rhinochetus* and *Eurypyga*, such is probably its condition in *Mesites* too [3].

The continuous head-feathering extends about halfway down the neck, and then gives off the dorsal and ventral tracts of each side, which are separated by well-marked spaces, of which the dorsal one is considerably the biggest. The feathering of the lower part of the neck is thus quadriserial, separated by as many *apteria*. In the lower part of the neck the two dorsal tracts, which are narrow but strongly feathered, are widely separated, and somewhat divergent, including between them the anterior pair of dorsal powder-down patches, but converge again in the interscapular region. Here they suddenly become much feebler, and are then continued on as the much more weakly-feathered posterior part of the dorsal tract, this

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[1] By soaking out the plantar tendons, I have been enabled to ascertain that there is a good *vinculum* between the *flexores longus hallucis* and *profundus digitorum*, the tendons of which are ossified near the bottom of the leg. In all ordinary Passeres, it will be remembered, this *vinculum* is quite absent.

[2] According to Nitzsch, however, this is the number met with in the male of *Menura superba*.

[3] In answer to an inquiry on this subject, M. A. Milne-Edwards has been kind enough to inform me that his spirit-specimen of *Mesites* is also unfortunately damaged at the root of the tail, but that on an examination of a skin he finds apparently an oil-gland present with *no* tuft.

The *third* patch is inferior in position, lying just at the comme
ment of the pectoral region, between the two halves of the inf
tract internally and the anterior extremity of their separated
toral branch externally.

The *fourth* patch is longer and narrower than its fellows, lyi
the ventral region just outside the middle part of the inferior

The *fifth* (lateral) patch lies more or less transversely, i
neighbourhood of the axilla, between the posterior ends of the
pectoral and humeral tracts.

No Ardeine bird has any such lateral pair of patches; and
Cancroma has the anterior dorsal pair. These moreover lie *ou*
and not *inside*, the dorsal tracts in that bird. On the other
the concentrated patches of *Mesites* may easily be derived fro
more diffused arrangement found in *Rhinochetus*[1] and *Eurypy*

A full account of the pterylosis of *Rhinochetus* is st
desideratum, Dr. Murie having unfortunately omitted any ac
of the systematically more-important contour-feather tracts i
account of the "dermal structures" of the Kagu (*l. c.*).

I have at present insufficient material to describe these thorou
though an examination of two imperfectly-feathered specime
spirit demonstrates considerable agreement between the Kag
Mesites. Of *Eurypyga* we likewise have but imperfect inform
due to Nitzsch[2], and not to my mind very satisfactory, ju
from the material before me.

In *Rhinochetus*, as in *Mesites*, the neck-feathering is quadri
though the median dorsal space is much narrower below an
lateral neck-spaces very broad; the two dorsal tracts terminate
together about the level of the anterior end of the scapulæ, an
quite separate from the posterior portion, which is only forke
slight extent anteriorly, and widely dilated mesially. These differ
seem to be due mainly to the greater development of the
powder-down tracts of *Rhinochetus*, these covering most of
dorsal aspect of the trunk, except a narrow median space alon
backbone and a reversed heart-shaped area on the pelvis, to
spaces therefore the contour-feathers are nearly confined.

Below, as in *Mesites*, the inferior tract of each side is near
quite broken up into two by the interruption of a patch of po
down feathers; and the *pectoral* branch is likewise quite sepa
from the main tract, as in no other bird known to me except *Me*
powder-downs also intervening between the two. The humeral
is quite free from the inferior one. On the other hand, i
number of its rectrices (16), and the absence of an aftersha
the feathers, *Mesites* differs from *Eurypyga* and *Rhinochetus*,
of which have 12 rectrices[3] and an aftershaft. The numb
primaries in all is 10.

Mesites, *Rhinochetus*, and *Eurypyga* agree together, but
from the *Rallidæ*, in having well-developed and strong rectric

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[1] Cf. Murie, Trans. Z. S. vii. pl. 56. figs. 1–3.

[2] 'Pterylography,' Ray Soc. ed. p. 129, pl. viii. fig. 15.

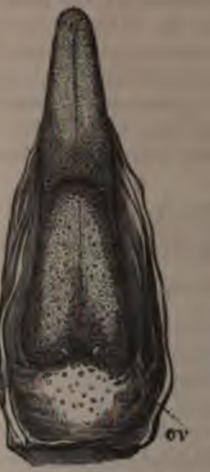
[3] *Rhinochetus* has not 10, as erroneously stated by Murie, loc. cit. p.

evenly with small, fine, soft conical papillæ directed backwards. Amongst them a few round fungiform papillæ are scattered; but these become much more conspicuous on the intermolar eminence. There is no sublingua.

The *salivary glands* are very largely developed.

The *parotid* is exceedingly large and of very loose texture, its very numerous lobules being very much scattered and in part loosely coherent. It is arranged in two superimposed layers in folds of gland-substance, and extends over the whole side of the neck, where it forms a large mass dipping into a triangular cavity above the *cleido-mastoid* muscle, between it and the *levator claviculæ*, and even a little beyond the clavicle. Its anterior margin is strongly concave forwards, extending almost as far anteriorly

Fig. 1.



Tongue of *Erethyzon dorsatus*.

ov, circumvallate papillæ.

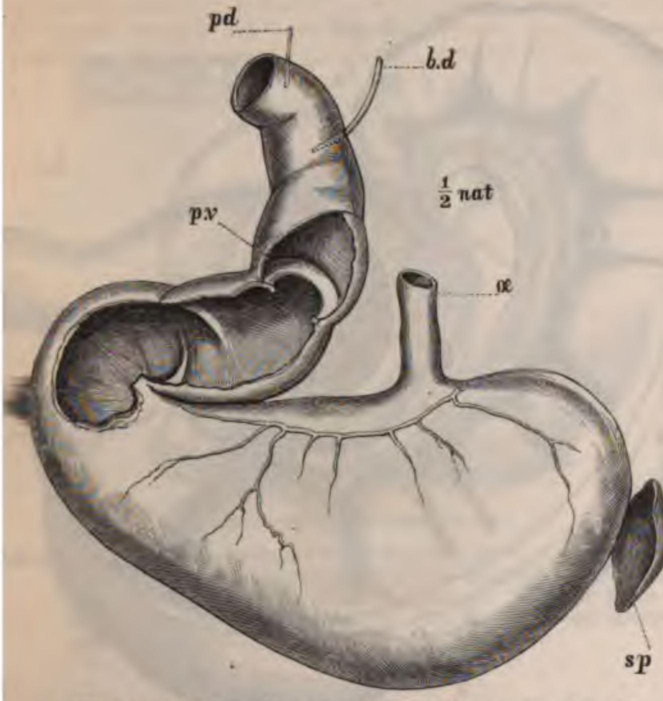
beneath the mandibular angle as it does in front of the opening of the external auditory meatus. Its duct runs forwards across the masseter muscle, just below and parallel with the lower border of the zygoma, to open beside the anterior molar tooth.

The *submaxillary* is large and of very similar texture to, but only between $\frac{1}{3}$ and $\frac{1}{4}$ the size of the parotid. It is pyriform in shape, lying beside the inner border of the masseter, and separated from its fellow of the opposite side by the sternohyoid muscles. Its duct runs forwards along the inferior margin of the masseter muscle to end as usual. The length of the submaxillary is about $2''\cdot4$, its breadth about $1''\cdot5$. The gland is almost divisible into two parts, he hinder and larger part being crescentic and placed just behind, beneath, and within the angle of the mandible. The duct runs forwards from the more anterior part of the gland.

There is a considerable *zygomatic* gland placed beside the upper molars, its duct opening in the vicinity of the last upper molar.

The *œsophagus* is rather narrow above (1″·0 in diameter), and extends for 2″·3 beyond the diaphragm.

Fig. 2.



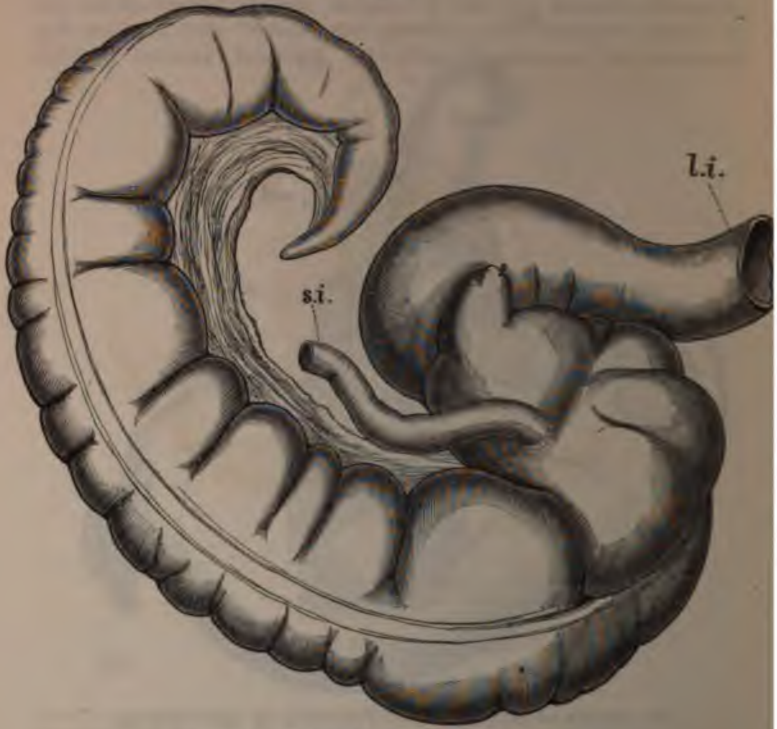
The stomach of *Erethizon dorsatus* partially cut open, showing the two internal folds.

œ, œsophagus; *b.d*, bile-duct; *p.d*, pancreatic duct; *p.v*, pyloric valve; *sp*, spleen.

The *stomach* is an elongated pyriform viscus, bent very sharply n itself towards its pyloric end. Its walls are very thin; and there re no longitudinal internal folds nor any marked transverse folds, xcept two. One of these is situated about an inch from the yloric valve, on the convex side of the pyloric flexure (*i. e.* on he stomach's greater curvature); the other, less marked, on the concave side of and close to the flexure of the pylorus, on the cardiac portion of the stomach. The cardia is largely developed, extending 4″·5 beyond the entrance of the œsophagus. The stomach of this species is much longer relatively than that of *Hystrix javanicus*, and it differs from the stomach of that species in having no sacculus between the cardia and pylorus.

Length of the stomach, measured along its middle, in its naturally

Fig. 3.



Exterior of the cæcum of *Erethizon dorsatus*.

l.i, large intestine; *s.i*, small intestine.

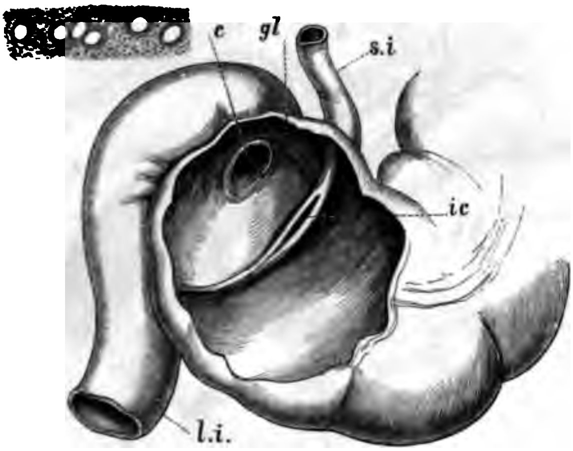
curved condition, 26″·6; vertical diameter of stomach at entrance of œsophagus 7″·6; its diameter at pyloric flexure 7″·6, from pyloric valve to entrance of bile-duct 3″·3, from entrance of bile-duct to that of pancreatic duct 2″·5.

The general arrangement of the intestine appeared to correspond closely with that found in the Guinea-pig,—folds of large intestine being arranged immediately behind the stomach and right segment of the liver; a conspicuous fold of small intestine lay towards the right side of the hinder part of the abdominal cavity, while the voluminous cæcum occupied its middle and part of its hindmost portions.

The small intestine measured 13 feet 3 inches. The large intestine measured 10 feet 9 inches—the whole intestine thus measuring 24 feet.

The diameter of the duodenum at its commencement is 3″·3; but at 2″·5 (1 inch) from the pyloric valve it contracts to 2″.

Fig. 4.



The cæcum of *Erethizon dorsatus*.

Interior of the cæcum, showing:—*ic*, the ileo-cæcal valve; *c*, the valvular constriction at the commencement of the large intestine; and *gl*, the line of glands extending between these two apertures. The colic pouch is the rounded prominence just beneath the letter *c*. The glands enlarged are figured separately.

The diameter of the ileum about 2″·5 (1 inch) from the ileo-cæcal valve is 1″·5. That of the colon at its first curve (just beyond the pouch of which its proximal end consists) is 3″·3; but 17″·8 (7 inches) nearer the anus it is only 1″·8.

The lower portion of the large intestine, however, is smaller in calibre than in the so-called small intestine.

The villi of the small intestine are short, but delicate and close-set. There are a few solitary glands in the large intestine.

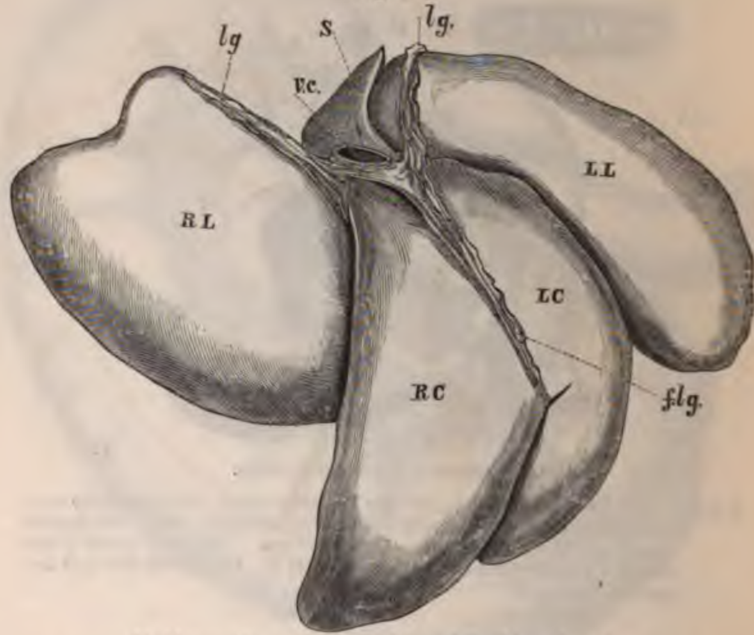
In the small intestine there are seventeen Peyer's patches—nine large and oval, and eight exceedingly small.

In the first five feet of the large intestine there is a series of glands, from 1″·2 to 3″·8 apart, situated along the free margin of the gut. Each consists of a little aggregation of from three to five crypts.

The colon is smooth and not sacculated, save slightly at its commencement, where one of the bands of the cæcum is continued upon it.

The cæcum is very large, and appears even yet larger than it is, because the proximal end of the colon, *l. i*, is dilated into a colic pouch which is 5″·3 ($2\frac{1}{10}$ inches) in diameter. There is no *sacculus rotundus* as in the Hare and Rabbit. The total length of the cæcum, measured (as curved) along its middle is 28 inches. Its breadth at the opening into it of the small intestine is 8″.1 ($3\frac{2}{10}$ inches).

Fig. 5.

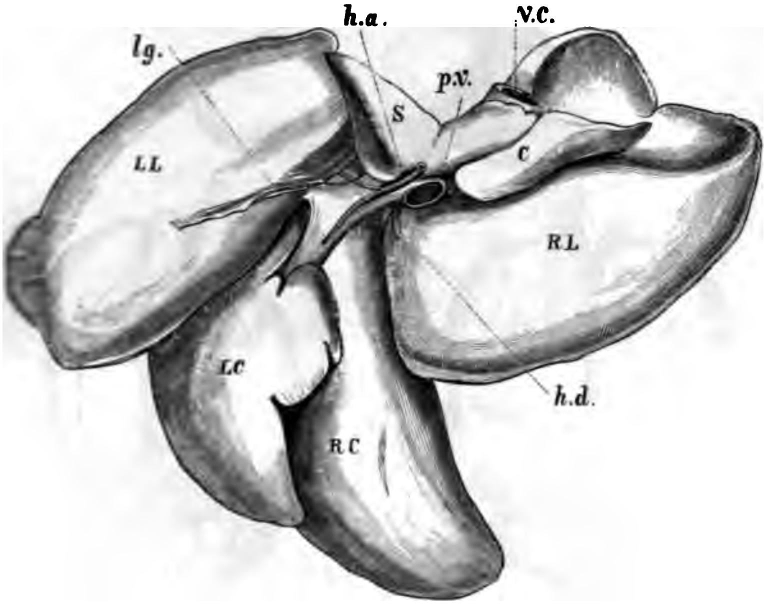


Diaphragmatic aspect of the liver of *Erethizon dorsatus*.

f.lg, falciform ligaments; *lg*, ligament; LC and LL, left central and left lateral lobes; RC and RL, right central and right lateral lobes; S, spigelian lobe; *v.c*, vena cava.

There are three longitudinal bands, one extending along the concavity of the viscus, where the mesentery is attached, and one on each side. Only one of the three bands is continued upon the colon, namely the band (that on fig. 4) which extends along that side of the cæcum which is opposite the entrance of the ileum. This band is much more marked on the colon of *Hystrix cristata* than on that of *Erethizon*. There is the normal ileo-cæcal valve, and besides this a very remarkable valvular constriction, or circular reduplication (*c*), at the entrance into the large intestine from the cæcum. It is something like the pyloric valve, only less defined, especially on one side[1]. An essentially similar structure exists in the Guinea-pig, of which I have not met with any description. There is no spiral valve in the cæcum, but only a series of constrictions corresponding to the sacculi formed by the longitudinal bands. There are no Peyer's patches; but there is a chain of glands (sixteen, single or in pairs) which extends across from the ileo-cæcal valve to the cæco-colic aperture.

Fig. 6.



Abdominal aspect of the liver of *Erethizon dorsatus*.

Letters as before; and C, caudate lobe; *h.a*, hepatic artery; *h.d*, hepatic duct; *p.v*, portal vein.

The *liver* consists of the normal four large lobes, with a small Spigelian and caudate lobe. There was, however, no gall-bladder in the specimen examined. The right segment is much larger than

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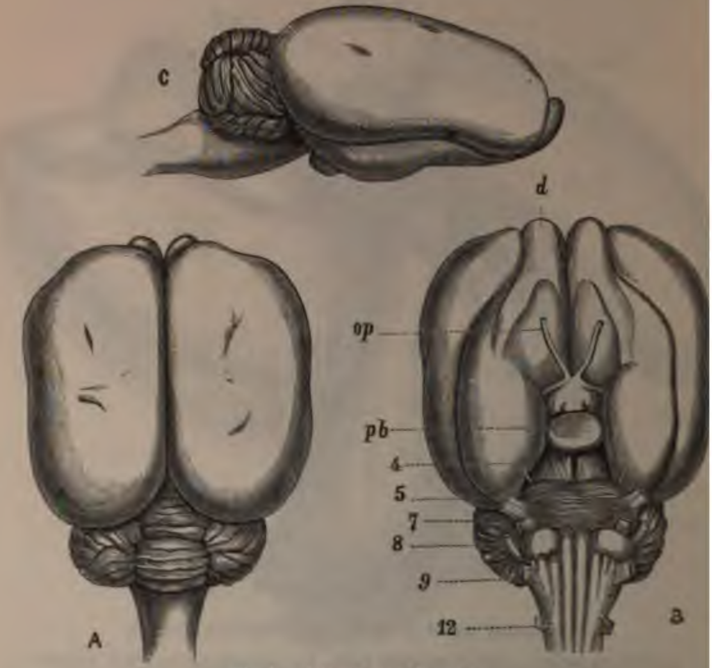
[1] A preparation showing this structure, made from the specimen here described, has been preserved in the Museum of the Royal College of Surgeons.

the left segment. The left lateral lobe is larger than the left central The right lateral lobe extends more transversely than dorso-ventrally roughly estimated, it about equals the left lateral lobe in size. Th right central lobe is quite undivided, showing only a superficial furro on the middle of its abdominal surface. The Spigelian and caudat lobes are both triangular in outline; and neither exhibits any segmentation.

Thus the liver of *Erethizon* differs much from that of *Hystri javanica*. In the latter I find[1] that, though it agrees in havin

Fig. 7.



Brain of *Erethizon dorsatus*.

A, upper surface; B, ventral surface; C, side view; *d*, olfactory lobe; *op*, opti nerves; *p.b*, pituitary body; 4, 5–7, 8, 9–12, pathetic, trigeminal, facia auditory, glossopharyngeal, and hypoglossal nerves.

the right segment much larger than the left, yet the left centra lobe is larger than the left lateral one; that the right lateral lob extends mainly dorso-ventrally; that the right central lobe has very deep cystic notch, in which a gall-bladder is found; that th right lateral lobe is larger than the left lateral lobe; that the le central is larger than the left lateral; and that the Spigelian lobe is larger both relatively and absolutely, and is also distinctly notched; and that the caudate lobe is larger and more slender. How far these may be individual peculiarities I am of course unable to say.

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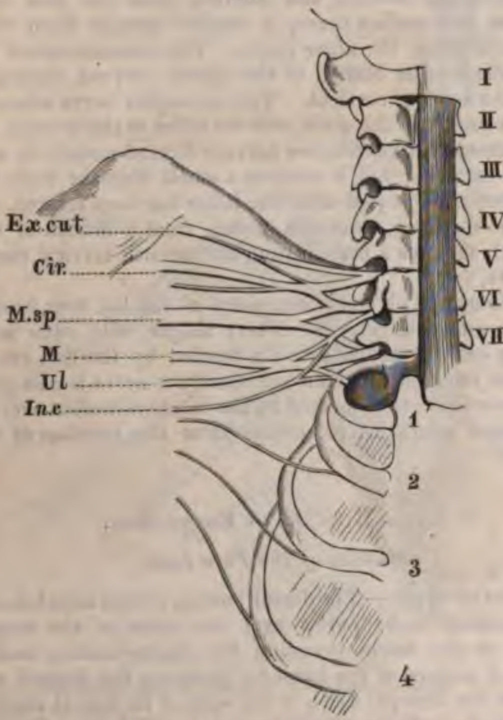
[1] From a specimen (no. 808 c) in the Museum of the Royal College of Surgeons.

The *spleen* was very different in form from that of *Hystrix javanica*. In the latter it is much elongated, while in *Erethizon* it is oval in shape and somewhat flattened. Its length is 3″·3, its breadth 2″.

The *lungs* consist of three lobes on the right side and two on the left, whereof the upper left lobe is divided by two deep notches.

Fig. 8.



The brachial plexus of *Erethizon dorsatus*.

I–VII, cervical vertebræ; 1, 2, 3, 4, the first four ribs; *cir*, circumflex nerve; *Ex. cut*, external cutaneous; *In.c*, internal cutaneous; *M*, median, *M.sp*, musculo-spiral; *Ul*, ulnar.

The *heart* is very rounded at its apex.

The *aorta* gives off a large innominate artery, from which the right subclavian and the two common carotids arise. The left subclavian is given off separately.

The female sexual organs have been described by Hunter; see his 'Essays and Observations,' vol. ii. p. 223.

The *brain* presents a much less decidedly quadrate form than that of the Porcupine (most probably *Hystrix cristata*) figured by Leuret[1]; and it is even more smooth, there being but a single short and slight depression (or rudimentary sulcus) at the hinder end of the most anterior third of the dorsum of each cerebral hemisphere. The pituitary body is very large, and the corpora trapezoidea well developed.

The *brachial plexus*[2] is formed by the sixth, seventh, and eighth cervical nerves together with the first dorsal.

The main part of the eighth cervical, having received a branch from the seventh cervical and another from the first dorsal, is continued as the *median* nerve, a smaller branch from the same junction constituting the *ulnar* nerve. The *musculo-spiral* nerve is formed by the smaller branch of the eighth cervical uniting with a portion of the seventh cervical. The *circumflex* nerve arises by two roots—one a branch of the sixth, and the other of the seventh, cervical nerves. The *external cutaneous* nerve is formed mainly by a branch of the sixth cervical; but it receives a small filament from the root of the circumflex nerve just after the latter has been formed, as above stated. The *internal cutaneous* springs from a branch of the first dorsal, which receives a branch from the seventh cervical root of the median nerve.

The *lumbo-sacral* plexus is composed of the last four lumbar and the first two sacral nerves. It is very simple, with little interlacement. The *anterior crural* nerve is formed by the first two of the six, from the junction of which the obturator nerve is also given off. The *great sciatic* nerve is formed by the last two lumbar nerves only; while the small sciatic nerve springs from the junction of the two sacral nerves.

LIMB-MUSCLES OF ERETHIZON.

Muscles of the Fore Limb.

Panniculus carnosus.—The dorsal portion of this muscle is inserted into the pectoral limbs partly over the spine of the scapula by attachment to the fascia investing the supraspinatus, and partly into the outer surface of the humerus (between the deltoid and the outer part of the triceps) down to the apex of its deltoid crest. The abdominal portion of the same muscle is inserted into the humerus outside the greater tuberosity and inside the upper part of the deltoid crest.

The *pectoralis* is so united with the ventral part of the panniculus that they seem like two parts of one muscle. The true pectoralis, however, arises from the sternum, and is inserted into the distal half of the deltoid crest of the humerus, being much connected with the adjacent part of the deltoid, and a portion running on to fuse with the brachialis anticus.

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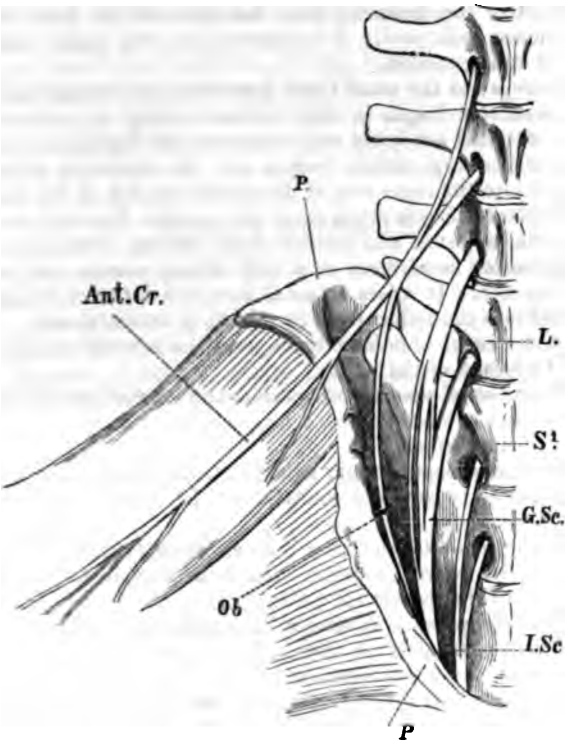
[1] See plate iii. of Leuret and Gratiolet's 'Anat. Comp. du Système Nerveux.'

[2] The brachial and lumbo-sacral plexuses were dissected out for me by Mr. W. Pearson; and the drawings are from his dissections.

The *sternocleido-mastoid*, arising as usual, is inserted into the antero-posteriorly extending ridge just behind the opening of the external auditory meatus.

The *levator claviculæ* arises, by a strong tendon, from the hypapophysial tubercle on the middle of the ventral surface of the atlas.

Fig. 9.



The lumbo-sacral plexus of *Erethizon dorsatus*.

Ant. cr, anterior crural nerve; *G. Sc.*, great sciatic nerve; *L*, last lumbar vertebra; *I. Sc*, small sciatic nerve; *Ob*, obturator nerve; *P*, pelvis; S^1, first sacral vertebra.

Expanding in a fan-shaped manner, it is inserted into fascia investing the acromion and the greater tuberosity of the humerus, its fibres mingling with those of the dorsal part of the panniculus carnosus.

The *latissimus dorsi* sends on a dorso-epitrochlear to the olecranon.

The *subscapularis* is a strong muscle arising from the cartilage of the first rib, and inserted into the outer part of the clavicle.

The *deltoid* has a distinct clavicular portion, as well as that from the metacromion and fascia investing the infraspinatus.

The *supraspinatus*, *infraspinatus*, *teres major*, *teres minor*, and *subscapularis* are as in the Agouti[1].

The *biceps* has the usual two heads and radial insertion.

The *coracobrachialis* consists of two parts—one descending to the middle of the humerus, the other down to the internal condyle.

The *brachialis anticus* takes origin from the back of the summit of the shaft of the humerus, from the whole of its outer side, and from its lower front part. It is inserted into the radial side of the ulna by a strong tendon.

The *triceps* has the usual three heads and the normal insertion.

The *supinator longus* is very distinct, arising by delicate fascia from the external condyloid ridge between the summit of the origin of the extensor carpi radialis longior and the brachialis anticus. It is inserted into the outer side of the styloid process of the radius.

The *supinator brevis* arises from the annular ligament and shaft of the radius as usual, and extends about halfway down the radius.

The *pronator radii teres* is a very strong muscle, and very tendinous beneath. It arises as usual from the internal condyle, and is inserted into the radius from its middle to its distal end.

The *flexor carpi radialis* extends from the internal condyle to the proximal phalanx of the index.

The *flexor carpi ulnaris* springs from the internal condyle and the olecranon, and is inserted into a large sesamoid on the outer side of the base of the carpus.

The *palmaris longus* is very adherent to the muscle last described. It arises from the internal condyle, and is inserted into a cartilaginous palmar disk.

The *flexor sublimis digitorum* is an exceedingly small muscle. It arises from the internal condyle. Near the wrist its tendon expands into a fascia which covers the palm.

The *flexor profundus digitorum* and *longus pollicis* consist of four fleshy bellies: the first of these (the deepest and largest) springs from the ulna and interosseous membrane and the proximal part of the radius; one part takes origin from the distal half of the flexor surface of the radius; the third and smallest part comes from the internal condyle; while the fourth part arises from the proximal part of the flexor surface of the ulna. These bellies end in a common tendon, which divides and goes to the five digits.

There are three *lumbrical* muscles, as in the Agouti[2].

The *pronator quadratus* extends over the lower (distal) half of the radius and ulna.

The *extensor carpi radialis longior* has a rather extensive origin from above the external condyle, quite distinct from that of the extensor carpi radialis brevior. It goes to the index, as usual.

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[1] See P. Z. S. 1866, p. 399.

[2] *L. c.* p. 403.

The *extensor carpi radialis brevior* is a larger muscle, and has a stronger tendon, than that last noticed, which overlaps it at its origin. It goes to the third metacarpal.

The *extensor communis digitorum* goes as usual from the external condyle to the four outer digits.

The *extensor carpi ulnaris* takes origin from the external condyle and adjacent parts of the ulna, and goes to the base of the fifth metacarpal.

The *extensor ossis metacarpi pollicis* is large and strong; it takes origin from the adjacent sides of the radius and ulna, but mainly from the ulna and the strong interosseous ligament. Its insertion is as usual.

The *extensor minimi digiti*, arising from the external condyle, sends tendons to the fourth and fifth digits.

The *extensor indicis* is very delicate; it takes origin from the middle of the exterior surface of the ulna, and sends its tendon to the index.

Muscles of the Hind Limb.

The *gluteus maximus* and *gluteus minimus* I found to be quite similar to those of the Agouti[1].

The *gluteus medius* is also as in the Agouti, save that the part of it which is inserted into the hinder side of the great trochanter is more distinct. I did not observe any distinct *scansorius*.

The *biceps* consists of two parts, which are very similar to those of the Agouti: the first part arises from the sides of the first four caudal vertebræ, and is inserted by a strong tendon into the outer side of the patella; the second part arises (being mainly tendinous at its origin) from the tuberosity of the ischium, external and superficial to the origin of the semimembranosus. It is inserted by fascia into the patella, the tuberosity of the ischium, the head of the fibula, and the external malleolus, and into the fascia which invests the outside of the leg.

The most slender accessory muscle of the biceps, or *tenuissimus*, takes origin from the strong fascia which binds down the dorsal caudal muscles at the root of the tail, on a line with the great trochanter, and at the anterior end of, and covered in by, the origin of the first part of the biceps. It is inserted into the heel and inner side of the sole of the foot; in its course it lies close to the hinder border of the second part of the biceps; at its insertion it unites with the plantar fascia, having a certain adhesion to the inner side of the tuberosity of the os calcis, and more to the plantar surface of the extra tarsal ossicle.

The *semimembranosus* also consists of two parts: one part, thick and fleshy, arises from the tuberosity of the ischium and the ramus below it. It goes to the upper half of the tibia (covered in by the insertion of the gracilis), and dips in beneath the internal lateral ligament of the lesser joint. The second part arises from the caudal vertebræ, beneath and closely connected with the hinder half of the origin of the first part of the biceps; it is inserted behind and above the inner condyle of the femur by a small, but strong, round tendon.

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[1] See P. Z. S. 1866, p. 405. What was therein taken to be the *tensor vaginæ femoris* I now believe to be the *sartorius*.

The *semitendinosus* has only a single origin (but a very extensive one) from the fascia investing the ilium, sacrum, and anterior caudal vertebræ; it is inserted into the groove on the outer side of the strong (deltoid-ridge-like) prominence on the front of the tibia, and by fascia into the tibia below and above that prominence. The upper part of its insertion is enveloped by that of the gracilis.

The *sartorius* arises from the anterior inferior spine of the ilium, and ends distally in the fascia investing the patella[1].

The *gracilis* consists of two distinct parts. The upper of these arises from the ilio-pectineal ridge and pubic symphysis; it is inserted into the inner side of the patella and head of the tibia, its aponeurosis of insertion being continuous with that of the second or lower part of the gracilis. This second part (which is very large) arises from the pubic symphysis and the adjacent ramus of the ischium; it is inserted into the front of the tibia from the patella to below the summit of the insertion of the semitendinosus.

The *adductor* is made up of four more or less distinct muscles:—

(1) Arises, beneath the gracilis, from the brim of the pelvis (ventrad of the origin of the pectineus) and from the front end of the pubic symphysis; it is inserted into the middle third of the back of the femur between the insertion of the pectineus and that of the second part of the adductor, its insertion descending below the insertion of the former, but not so low as that of the latter.

(2) The second part of the adductor (*adductor magnus*) arises from the symphysis pubis and the adjacent ramus of the ischium, covered in by the gracilis; it is inserted into the lower half of the middle of the posterior surface of the femur. There is no Hunter's canal, the great femoral artery passing along the inner side of the lower end of the muscle.

(3) This part (*adductor primus*) arises from the brim of the pelvis, dorsad of the origin of the first part of the adductor; it is inserted into the back of the femur, on the inner side of the first part of the adductor and closely connected with it, although not extending so far downwards, though it is conterminous above with that first portion.

(4) The fourth part of the adductor arises from the pubic symphysis beneath the adjacent parts of the origins of the first and second portions of the adductor. It passes down beside the hinder margin of the pectineus, and is inserted into the outside of the great trochanter. The great sciatic nerve passes down outside its insertion.

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[1] This is the muscle which was described as the *tensor vaginæ femoris* in the Agouti (P. Z. S. 1866, p. 405); while what is there (p. 409) described as the sartorius, is really, I believe, the upper portion of the gracilis.

The *pectineus* extends from the brim of the pelvis dorsad of the origin of the third part of the adductor; it is inserted into the femur just below the lesser trochanter.

The *vastus externus* is very large, its origin extending right up to the summit of the great trochanter.

The *vastus internus* also extends very high up, namely up to the neck of the femur, dipping in within the insertion of the psoas.

The *crureus* extends up to the neck of the femur, and is very imperfectly separated from the vastus internus.

The *rectus femoris* has the usual origin and insertion.

The *tibialis anticus* is very large, but does not take origin from the femur; it arises from the head of the fibula and the upper third of the tibia. Below its ends are two tendons, one of which is inserted into side of the proximal end of the metatarsal of the hallux, while the other goes to the plantar surface of the ectocuneiforme.

The *extensor longus digitorum* arises by a tendon from the femur external to its rotular surface. It is a slender muscle, and sends tendons to the four outer digits.

The *extensor longus hallucis* is very slender and small, arising only from the distal third of the fibula.

The *extensor brevis digitorum* arises as usual, and sends tendons to the four outer digits.

The *peroneus longus* is the most external of the peronei muscles, and arises from the head of the fibula. Passing behind the external malleolus, it proceeds to the metatarsal of the hallux as usual.

The *peroneus brevis* arises from the antero-external aspect of the fibula. It is muscular down to the level of the malleolus, and ends in a very strong tendon (the largest of the peronei tendons), which is inserted into the proximal end of the fifth metatarsal.

The *peroneus quinti digiti* is very slender, both as to its muscular belly and its tendon. It arises from the outside of the fibula, beneath the peroneus longus and behind the peroneus brevis, and in contact with the flexor longus hallucis. It becomes tendinous above the external malleolus; and its slender tendon is inserted into the proximal part of the proximal phalanx of the fifth digit.

The *gastrocnemius* has but the two normal heads, and is inserted into the calcaneal tuberosity.

The *soleus* is very large and fleshy; it arises from the outer side of the upper two thirds of the fibula, and joins the tendo Achillis.

The *plantaris* takes origin from the pit on the outer side of the external condyle of the femur, beneath the external lateral ligament. It ends as in the Agouti[1].

The *popliteus* is as in the Agouti.

The *flexor longus digitorum* is a large muscle arising from the tibia beneath the popliteus; its tendon passes in a groove behind the internal malleolus, superficially to that of the tibialis posticus. It unites with the tendon of the *flexor longus hallucis*—which is of great size, and takes origin from three fourths of the fibula; its very large tendon passes in a groove by itself (external to that of the flexor longus digitorum), and goes (after being joined by the tendon of the flexor longus digitorum) to the four outer toes.

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[1] P. Z. S. 1866, p. 414.

The *tibialis posticus* is of about the same size as the flexor longus digitorum. It arises from the head of the fibula and the fascia between it and the popliteus and between it and the flexor longus hallucis, with which it is closely connected. Its fleshy belly is visible in the middle of the back of the leg, the gastrocnemius having been removed. Its tendon passes in a groove behind the internal malleolus, beneath that of the flexor longus digitorum, and, passing to the edge of the foot, is inserted into the naviculare.

The *flexor accessorius et brevis digitorum* seems to be represented by a small muscle which takes origin from the tibial side of the os calcis, and ends in two tendons, one of which is inserted into the second phalanx of the hallux, and the other into that of the index; while muscular fibres of what seems to be the same muscle are inserted into the deep flexor tendon common to the flexor longus digitorum and flexor longus hallucis.

March 7, 1882.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary exhibited some living examples of *Helix hæmastoma* from Point de Galle, Ceylon, which had been forwarded to the Society by Mr. J. Wood-Mason, F.Z.S., of the Indian Museum, Calcutta. Mr. Wood-Mason, writing on the subject, had remarked that "this Snail lives on the Cocoa-nut Palms; and it is interesting to find that the same *Alga* that is found on the trunks of the palms has established itself on the outside of the shell, on which it forms a protective coating. *Helix superba* has also a similarly green protective coating, rendering it less visible to passing birds."

The following papers were read:—

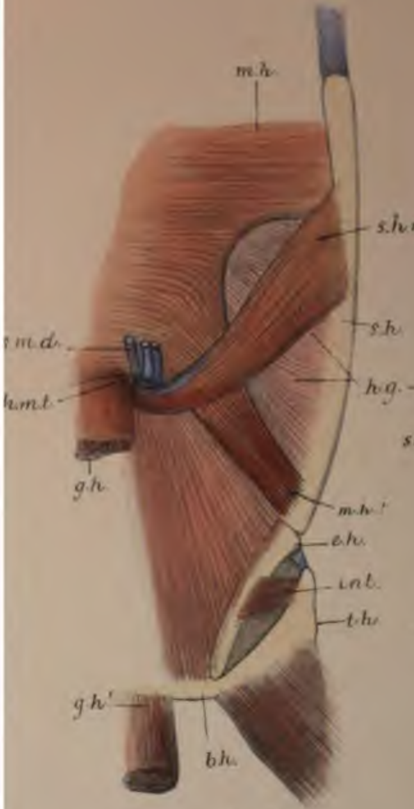

Fig 2.

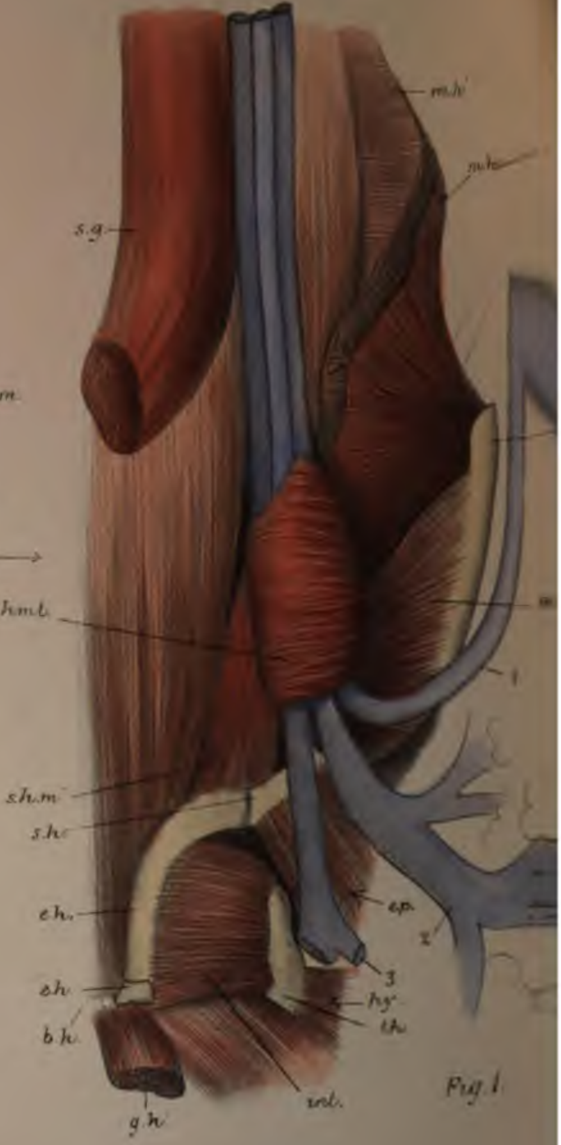

Fig. 1.

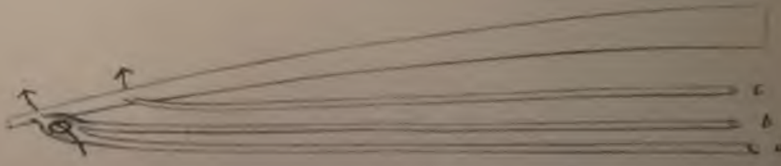

Fig. 3.

J. Smit lith.

ANATOMY OF MYRMECOPHAGA.

1. On some Points in the Anatomy of the Great Anteater (*Myrmecophaga jubata*). By W. A. Forbes, B.A., Prosector to the Society.

[Received February 28, 1882.]

(Plate XV.)

The literature relating to the anatomical structure of the Edentata, though very considerable, is unfortunately much scattered, and with many blanks as regards special points. The genus *Myrmecophaga* may be considered—thanks chiefly to the labours of Owen[1] and Pouchet[2], who have elaborately described many parts of its organization—to be the best known, as regards anatomical structure, of all the existing Anteaters. Two adult female specimens of this animal having lately[3] passed through my hands in my prosectorial capacity, I have had the opportunity of confirming a large part of the already published accounts of its anatomy, as well as of correcting, or adding, certain details, which I now lay before the Society.

1. ***Alimentary Canal and Appendages.***—The palate (fig. 1, p. 288) is not absolutely smooth, but presents anteriorly a series of irregular transverse ridges notched along their margin, best developed and nearly meeting mesially anteriorly, posteriorly becoming much more oblique backwards and less regular, the ridges not being opposite each other but more or less alternating. In all there are about seven of these ridges. The floor of the mouth to about 2 inches beyond the most posterior opening of the submaxillary glands, the gums over the tip of the lower jaw, and the lateral callous pads which are present as in *Tamandua*, are all covered with minute, retroverted, closely-set papillæ.

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[1] "On the Anatomy of the Great Anteater," Part I., Trans. Zool. Soc. iv. pp. 117-140, pls. xxxvii.-xl.; Part II., *l. c.* pp. 179-181, pls. li.-liii.

[2] Mémoires sur le Grand Fourmilier: Paris, 1874.

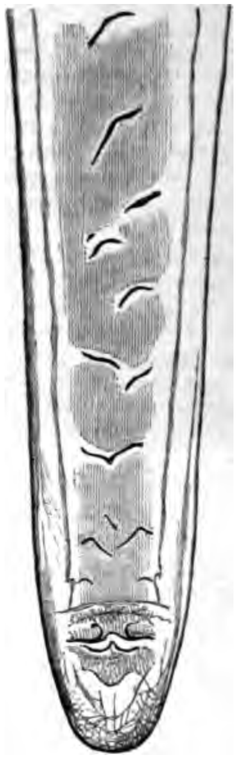
In addition to these, there are brief references to *Myrmecophaga jubata* in Rapp's 'Edentaten' (2e Aufl., Tübingen, 1852), and Prof. Flower's Hunterian Lectures (Med. Times and Gazette, Nov. 30, 1872, p. 591). The submaxillary glands have been described by Gervais (C. R. lxix. pp. 1110, 1111 [1869]); and the brain by the same author ("Mémoire sur les formes cérébrales propres aux Edentés vivants et fossiles," Nouv. Arch. Mus. v. pp. 1-56, pls. i.-v.), and by G. Pouchet ("Mémoire sur l'encephale des Edentés," Robin's Journal de l'Anatomie, 1868, pp. 658-675, and 1869, pp. 1-18, &c.).

[3] The first of these, from Buenos Ayres (spec. *d* of the List of Vertebrates), was presented to the Society by the Hon. L. S. Sackville West (now H. B. M's. Minister at Washington) on Sept. 7, 1877. It died Nov. 29, 1881, from severe inflammation of the connective tissues lying in and around the submaxillary glands.

The second (specimen *a*) was presented so long ago as October 4, 1867, by Dr. J. A. Palin, C.M.Z.S., and, after living for more than 14 years in the Society's Gardens, died on the 5th of February of the present year. The only disease detected in it, on *post mortem* examination, was a considerable enlargement of the thymus gland, and acute inflammation of the laryngeal mucous membrane. This second specimen, though an aged animal, was by no means so large as the first, having a total length of 6 ft. $1\frac{1}{4}$ in. (from the tip of the nose to the end of the tail, which was 2 ft. 4 in. long), as against 7 ft. $5\frac{1}{2}$ in. in the other.

The tip of the tongue is quite glabrous and globular; but the greater part of the rest of its extent, anterior to the pair of circumvallate papillæ, is dorsally and laterally covered with similar, but smaller, retroverted papillæ, best developed towards the tip of the organ, and gradually getting smaller and smaller towards its base, till they are scarcely visible to the unaided eye except in certain lights. There is a median glabrous line, or shallow groove running along the

Fig. 1.



Palate of *Myrmecophaga jubata*; from a preparation in the Museum of the Royal College of Surgeons, prepared from specimen *a*.

tongue till near its apex; but this is ventral in position. According to [illegible] Owen there is a similar dorsal one; but if so, it is not very evident (*l.c.* p. 129). The dorsal surface, however, is slightly fluted towards the apex. In front of the circumvallate papillæ a slightly raised median longitudinal ridge extends for some 5 inches.

My observations on the salivary glands agree well in most points with those of my predecessors, except as regards the number and openings of the ducts to the submaxillary glands, regarding which very different statements have been made at various times. Of these, Gervais's description, as given in some remarks accompanying the exhibition before the French Academy of Sciences of some models of these glands (C. R. *s. c.*), agrees best with my observations. He says:—"*Deux paires* des canaux dont il s'agit viennent aboutir separément dans la bouche en se rendant a deux poches situées auprès de la symphyse mentonnière; la *troisième* paire verse un peu en arrière, également dans une petite dilatation terminale."

A similar arrangement is described by J. Chatin in the genus *Tamandua*[1], except that he says that there are *two* openings on *each side* at the symphysis. Pouchet, on the other hand, maintains ('Mémoires' &c. pp. v and 88) that there are only *two* ducts on each side, one of these being formed by the confluence of two of the three primary ducts coming from the corresponding three lobes of which each gland is composed. He only describes a single pair of openings close to the symphysis. Owen, finally, describes the three ducts of each side as eventually uniting, and opening, also by a single aperture, close to the symphysis.

An examination, however, of his specimen (now preserved in the Hunterian Museum, where, by the kind permission of Prof. Flower, I was allowed to examine it), demonstrates the existence of a second pair of apertures in the floor of the mouth situated some 2 inches behind the first pair, which lie immediately behind the symphysis, in this respect quite agreeing with Gervais's description, and with my own observations on the second of my (fresh) specimens (*vide* Plate XV. fig. 3 *c*). This second pair of apertures, which lie close to each other on each side of the median line and are very minute, are the openings of the deeper ducts, which, one on each side, arise from the more anterior (*cervical*) portion of the gland[2]. As these lie quite behind the other pair of apertures, any injection passed into the latter can of course only fill the two pairs of ducts (*a*, *b*) which debouch into them. This may easily explain, therefore, Pouchet's only having found *two* ducts on each side, though it is possible that individual specimens may vary in this respect. I must at least notice that in the first specimen that passed through my hands (the submaxillary ducts of which were injected from the anterior pair of apertures alone), I found on the left side a *single* duct only, and on the right *two*, which united together at about the level of the articulation of the lower jaw. This specimen, however, had, it is to be remembered, extensive inflammation in these parts, which may possibly have effected an alteration in the relations and number of the ducts. It is pretty clear, however, that three pairs all together is the ordinary number of these ducts, that having been found in Gervais's specimen (perhaps in two), in Owen's, and in one of mine for certain.

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[1] Ann. Sci. Nat. 5, (Zool.) xiii. art. no. 9.

[2] Such was, at least, the condition in the only specimen of *Myrmecophaga* in which these ducts had been satisfactorily injected examined by me. In *Tamandua*, according to Chatin's figure (*op. cit.* pl. 14), it is the ducts from the posterior (*sternal*) part of the gland that open here. This point requires re-examination, as also the number of apertures anteriorly.

I found the opening of the two other ducts exactly as described by Pouchet (*l. c.* p. 89) and Gervais, one of these being dilated terminally, the dilatation receiving the other duct and opening by a *single* aperture into the mouth (*vide* Plate XV. fig. 3).

At the point where the three submaxillary ducts of each side, coming from the three lobes of the gland, converge, and become united intimately by their walls to each other, they become surrounded by a bulb-like mass of muscular issue, the exact relations of which I shall describe below. But I could not perceive that this structure, which externally looks like a bulbous reservoir surrounded by a muscular coat, corresponded to any dilatation of the ducts which pass through it; on the contrary, these seem to preserve a nearly uniform diameter throughout this part of their course, a condition corresponding to that described by Chatin in *Tamandua*.

The terminal reservoirs, I may add, of the two pairs of submaxillary ducts lie just above the long thin median tendon of the genio-hyoid, the contraction of which muscle may possibly, by compressing the floors of these reservoirs, aid in the ejaculation of the fluid contained in them.

The stomach of *Myrmecophaga* generally resembles Prof. Owen's figures and description; but the thick pyloric pads are softer and more vascular, and the whole less gizzard-like, than I had been led to anticipate from his account. The gyriform folds of the mucous membrane of the cardiac part of the stomach, which quite resemble those of the stomach in many other animals, are, in particular, not happily represented in his fig. 1, pl. lii.

The liver of both specimens agrees very well with Prof. Flower's description of this viscus. Both caudate and Spigelian lobes are practically absent.

As accurately described by Pouchet ('Mémoires,' pp. 191, 192), the pancreatic duct ends in a vesicle, in the walls of which the hepatic duct runs for a little way and then opens into it, the vesicle then opening by a separate aperture into the duodenum.

In the first (larger) specimen examined by me the intestines measured as follows:—small intestine 24 ft. 10 in., large intestine 2 ft. 3½ inches. The cæcum can hardly be said to exist as a separate part. The median longitudinal ridge of mucous membrane was continuous for the posterior 15 feet 3 inches of the small intestine, and reappeared above this at intervals in a less regular and less developed way.

I could see no *longitudinal* folds of mucous membrane, such as are described by Owen, in the rectum, which, however, had distinctly *transverse* ones, irregularly disposed in a gyriform way, well marked.

The right lung is trilobed, with an azygos lobe superadded; the left lung is bilobed, the lowest lobe in each lung being biggest.

The kidneys are quite smooth externally: there are no distinct Malpighian pyramids, the tubules opening internally on a single slightly-elevated ridge, which in one specimen is divided into three or four slightly-marked papillæ.

2. *Brain.*—The late Prof. Gervais has given, in his memoir on the brain of Edentata, figures of the superior, inferior, and lateral aspects of the brain of *Myrmecophaga jubata*, as well as of the cranial casts of that and the other species of Anteater[1]. Pouchet, in his 'Mémoires,' also gives figures of the cranial casts of *Myrmecophaga*, and, in the article in the 'Journal de l'Anatomie' above cited, representations of the brain itself of *Tamandua* and *Cycloturus*, that organ having been previously figured in the latter species by Tiedemann[2].

As I find Gervais's figures of the brain in some respects unsatisfactory, I have taken this opportunity of giving representations of the brains extracted from my two specimens, including one showing the disposition of the deeper parts (figs. 2, 3, 4, pp. 292, 293).

The olfactory lobes are very large, projecting forwards for ·7 inch in front of the cerebral hemispheres: in the lateral view of the brain they occupy, at least anteriorly, almost the lower half of the parts there exposed. They are continuous basally with the well-developed "hippocampal lobe," in front of which appears a large oval swelling of grey matter, on the middle root of the olfactory lobe, of an antero-posterior extent of more than half an inch. Towards their base, the olfactory tracts are curiously marked by slight transverse impressions (fig. 3) giving them a striated appearance, which may also be observed in the corresponding regions in the brains of *Tamandua* and *Orycteropus*. The cerebral hemispheres are but little arched superiorly[3]; but the *vermis cerebelli* is very prominent, rising above the general level of the hemispheres (fig. 2). Viewed from above, the hemispheres appear somewhat truncated posteriorly, though they here completely conceal the *corpora quadrigemina*, abutting on the cerebellum (fig. 2). Attaining their greatest breadth anterior to this, a little in front of the level of the posterior end of the median fissure (1·95 inch long), they taper somewhat rapidly anteriorly.

The cerebellum is well convoluted, with its lateral extent (1·5 inch) greater than its antero-posterior (1·15). The vermis is much narrower than the lateral lobes; it is prominent, and in one specimen (the larger) considerably twisted on itself. The flocculi are distinct.

The nates are much larger than the testes: the latter are very narrow from before backwards as compared with their combined transverse extent (·075 : ·6 inch), and are not distinctly separated from each other. The nates are larger, more prominent, and distinctly paired, being separated by a well-marked constriction; they are somewhat triangular in shape, with their longer axis transverse.

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[1] Nouv. Arch. v. pl. i. figs. 3, 3*a*, 3*b*, pl. ii. figs. 1–3.

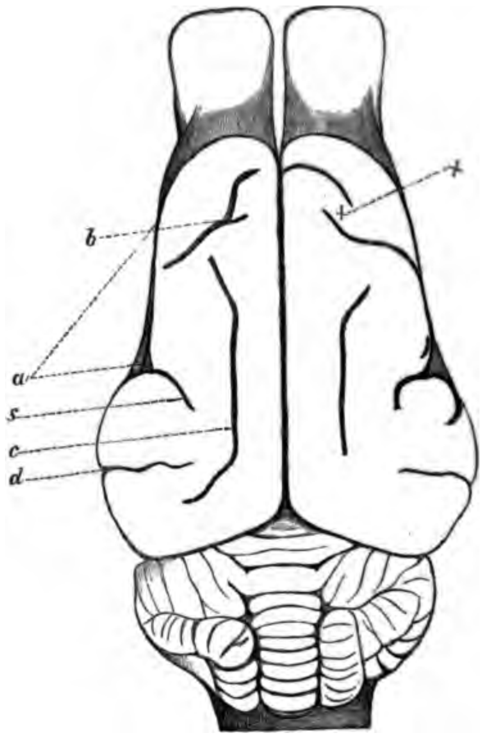
[2] Icones cerebri Simiarum, pl. v. fig. 8.

[3] Gervais's figure, *l. c.* fig. 3*a*, makes their outline much too convex antero-posteriorly.

The pineal gland has a distinct hard mineral deposit; its peduncles are easily made out.

There is no very distinct *corpus mamillare*, it being only represented by a white swelling on the infundibulum. The *hypophysis cerebri* is very large. The anterior commissure is distinct, but not particularly large, its antero-posterior extent being ·15 inch. The soft commissure is very large (·25 inch long); the posterior distinct. The third nerves are small, the optic not large.

Fig. 2.



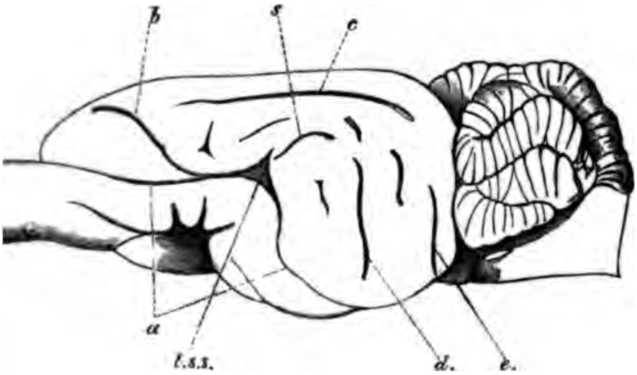
Brain of *Myrmecophaga jubata* (specimen *a*) from above.

There is a good septum lucidum (·25 inch deep anteriorly), with a contained fifth ventricle. The fornix is very well developed, with but few precommissural fibres. The corpus callosum is very well developed, more than an inch long, and nearly horizontal in position, with but a slight *genu* anteriorly. Posteriorly it forms, with the fornix, a prominent pad (*bourrelet*).

The cerebral sulci are not exactly alike in my two specimens, the brain of the bigger of the two animals, though of the same dimen-

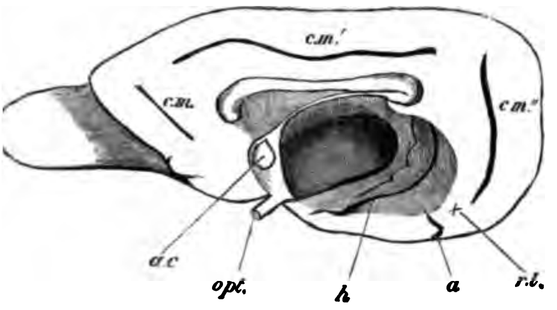
its fellow, being more richly convoluted by the development
minor fissures and impressions not present in the other. It
f which the lateral and internal views are here figured (figs. 3,

Fig. 3.



Brain, from the side, of specimen *d*.

Fig. 4.



same, from the inside. All these figures are of the natural size.

ic. fissure, inferior arc of (Broca); *b*, fissure of Rolando (Broca);
rimary parietal sulcus; *d*, *e*, additional sulci of circumsylvian gyrus;
issure of Sylvius; *l. s.s*, island of Reil (*lobule sous-sylvien*, Broca);
, *c.m'*, *c.m''*, calloso-marginal sulcus (superior arc of limbic fissure,
oca); *h*, hippocampal sulcus; *a. c*, anterior commissure; *opt*, optic
ve; *r.l* (fig. 4), "Pli de passage rétro-limbique" (Broca); + (fig. 2),
dging convolution between frontal and parietal lobes.

description of the main sulci is taken from the simpler
(represented in fig. 2), but applies in all essential respects to

factory lobe is separated from the cerebral hemispheres above by a shallow fissure (*a*), which, at the level of the anterior extremity of the prominent "hippocampal lobe," turns downwards, and runs along the external and inferior face of that lobe till it terminates on its inner face (fig. 4, *a*), not, however, reaching the hippocampal sulcus (*h*). At the point where its downward course commences there is a small triangular area (*l. s.s.*) exposed on the lateral surface of the brain, from which a short curved shallow sulcus (*s*) runs a short way upwards, forming with the descending part of *a* a forwardly-convex curve. In the larger specimen figured (fig. 3) this short upwardly-running sulcus (*s*) is separated, as will be seen, by a narrow bridging fold from the triangular depression and its posterior continuation (*a*). From the antero-inferior angle of this triangular space, but separated by a very narrow, more or less deep, bridging convolution from *a*, another sinuous fissure (*b*) runs forwards and upwards to terminate near the anterior angle of the hemisphere[1]. Above, on the supero-lateral aspect of the brain, and nearly parallel with the median longitudinal fissure, is a distinct longitudinal sulcus (*c*), convex upwards, which runs in an antero-posterior direction for a space of 1·2 inch.

Finally, parallel with the posterior edge of the hemisphere, dividing the external surface of this "temporal lobe," is a vertically-directed sulcus (*d*) about ·75 inch in extent.

On the internal aspect of the brain (fig. 4) runs a well-marked "calloso-marginal" sulcus (*c.m*), broken up into three or more parts, the most posterior being nearly vertical in position, and separated by but a little space from the posterior extremity of fissure *a*. In its usual position is a well-marked hippocampal sulcus (*h*), with a broad "*fascia dentata*" between it and the *corpus fimbriatum*, the *fascia dentata* being continued, as described by Prof. Turner in *Dasypus*[2], as a thin layer of longitudinally-disposed fibres over the *corpus callosum* to near its *genu*. The hippocampal sulcus does not extend as high as the *corpus callosum*. The lateral ventricle is fair-sized: I can see not a trace of any posterior cornu. The *hippocampus major* is strongly convex. The "hippocampal lobe" has, on its inferior aspect, a few irregular dentations developed near its antero-internal angle.

In the smaller and simpler brain of *Tamandua* (represented diagrammatically in fig. 5, p. 295), the only sulci present are those corresponding to *a*, *b*, *c* in the larger species, with some slight representatives of *d*.

Adopting the late Prof. Broca's ideas[3] as to the nature and composition of the "*scissure limbique*," the inferior arc of this is clearly represented by the fissure *a*, which is separated by a narrow "*pli de passage rétro-limbique*" (fig. 4, *r.l*) from its superior arc, represented by what we commonly call the "calloso-marginal sulcus" (*c.m*, &c.). The slight sulcus at *s*, developed above the triangular depression, will accordingly be the Sylvian fissure. *b* is then, following Broca's identifications, the fissure of Rolando, the gyrus lying anterior to and below it being the reduced equivalent of the frontal lobe. As has already been pointed out, this gyrus is connected posteriorly by a small, sometimes deep, bridging fold with the triangular space (*l. s.s.*) below the Sylvian fissure. This triangular space is Broca's "*lobule sous-sylvien*," its equivalent in the Primates being the lobe of the island of Reil (*l. c.* p. 430).

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[1] In the smaller specimen (fig. 2), this fissure is, on the right-hand side only, broken up into two by a narrow bridging convolution (+).

[2] Journ. Anat. Phys. i. p. 314 (1867).

[3] "Anatomie comparée des circonvolutions cérébrales. Le grand lobe limbique et la scissure limbique dans la série des Mammifères," Revue d'Anthropologie, vii. pp. 385–498.

The longitudinal sulcus *c* corresponds probably to Broca's "*sillon pariétal primaire*;" the gyrus above and internal to it will thus be the "*circonvolution sagittale*," that below it the "*circonvolution sylvien*," which in the more-convoluted of the brains figured (fig. 3) becomes divided up by smaller sulci (*d*, *e*, &c.) into a number of imperfect gyri.

Fig. 5.

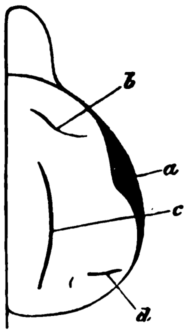

Diagram of right cerebral hemisphere of *Tamandua tetradactyla*, from above.

From my study of the brains of the remaining genera of Edentata, I have little doubt that the sulci *a*, *b*, and *c*, here described, can be traced, with various modifications, in nearly all the members of this group. *Orycteropus* in its cerebral characters seems to approach *Myrmecophaga* more nearly than any other form, the sulci and gyri of the brains of the two forms, as well as their general conformation, being very similar; *Manis* seems to possess the three typical sulci well developed; and these are also present in the larger Dasypodidæ, though apparently much reduced in the smaller forms of that group. The Sloths conform to the same general type. But, in the absence of a larger series of brains of this group than is at present available for comparison, satisfactory generalization on this subject is impossible, most of the published figures of Edentate brains being very unsatisfactory in detail, whilst nothing of importance is known as regards the development of the sulci in any member of this group.

3. *Female Generative Organs* (fig. 6, p. 297).—These have been briefly described by Pouchet[1], as well as by Rapp; but their accounts will, in some respects, bear supplementing.

A cloaca, in the true sense of the word, is not present in the Great Anteater. The *labia majora*, which bound the vertical urino-genital fissure, are very prominent and hirsute. Above them, but separated by a distinct perineal space, slightly hair-clad, is the transverse anal aperture, the mucous membrane lining which is pink, quite different from that of the lower passage and its boundaries, which is grey. Slightly inclosing these two apertures above is a widely-open V-shaped tegumentary fold, with its apex situated superiorly towards the root of the tail.

There are no *labia minora* visible; and no clitoris is present as a free organ, though the *corpora cavernosa* can be felt as tough bodies lying in the walls of the vulva.

The length of the urino-genital canal is 2·7 inches: about 1 inch from its external orifice may be seen, on each side of the middle line, two or three small pore-like depressions; a bristle passed through the largest of these enters a short duct, connected with one of a pair of globular compact glands about the size of a small cherry, which lie in the walls of the urino-genital canal above, between it and the rectum. They are, no doubt, "vulvo-vaginal" glands, or glands of Bertolini, corresponding to the male Cowper's. The urino-genital canal is lined by smooth, vascular, mucous membrane.

Communication between this and the next section of these organs is effected by means of two small apertures, each admitting readily enough the passage into the vagina, through the here constricted walls of the common tube, of a probe. From between these apertures is prolonged downwards, for a slight distance along the dorsal wall of the urino-genital canal, a slight ridge of mucous membrane, on each side of which are visible numerous small pore-like apertures, arranged in series in lines running outwards from the middle line.

On laying open the vagina along its anterior wall, it is seen to pass above with no marked constriction or "*os uteri*" into the pyriform simple uterus, the only distinction between the two parts being afforded by the thicker and more muscular walls of the uterus, and by the difference in the character of the mucous membrane, this being quite smooth and spongy in the uterus, whilst that of the vagina is thrown into a close-set series of thick, more or less longitudinal, somewhat foliaceous plaits. For about the lower inch of the vagina there extends a complete median septum, attached to both dorsal and ventral walls of the tube, extending a little further along the dorsal wall, and terminating superiorly by a free semilunar margin, concave upwards. Hence the terminal part of the vagina consists of two quite separate tubes, fused together above, but each opening into the urino-genital sinus by a single aperture of its own below.

The vagina proper measures about 4 inches in length. The pyriform uterus is not more than 2 inches long: it presents not the slightest sign of being double. Its walls are very thick and muscular;

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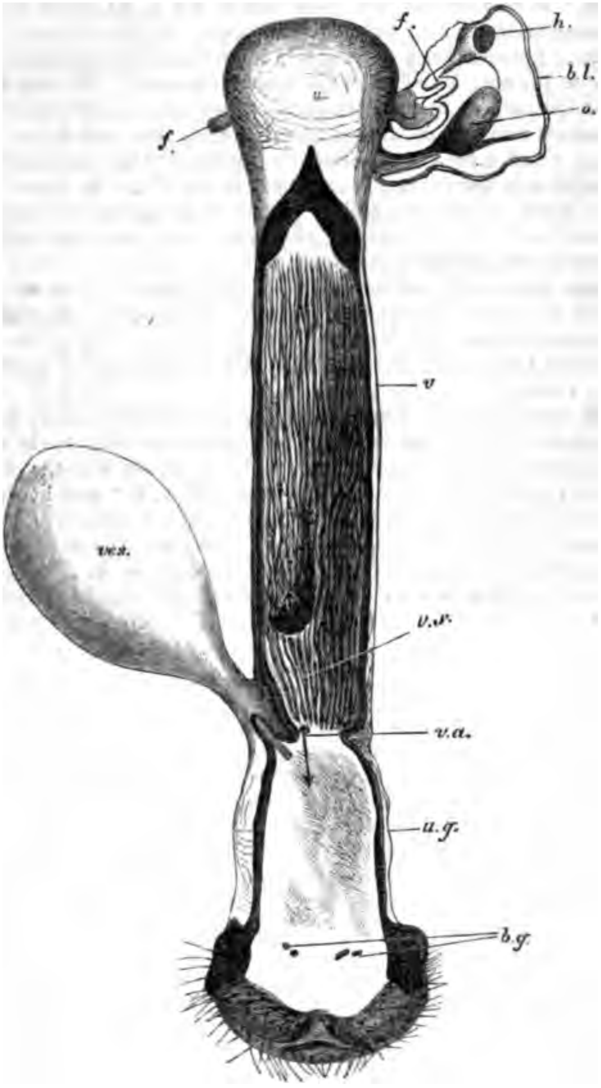
[1] Mém. p. 194.

Fig. 6.



Female generative organs of *Myrmecophaga jubata*, from before, reduced, and somewhat diagrammatic. The walls of the tube have been laid open anteriorly to show the vaginal septum (*v. s*), beneath which an arrow is passed, appearing above in the vagina (*v*), and below emerging by the vaginal aperture of that side (*v. a*) into the urino-genital canal (*u.g*). The opening of the vagina into this on the other side is laid open.

b.g, openings of Bertolini's glands; *ves*, bladder, turned to one side; *u*, uterus; *f,f*, Fallopian tubes (cut short, with the rest of the uterine appendages on the left side); *o*, ovary; *h*, hydatid of Morgagni; *b. l*, broad ligament of the uterus, cut short.

but there is no constriction or valve at all at its junction with the vagina. It receives the Fallopian tubes, not at its supero-external angles as in *Homo* &c., but at a point about one third down its total length. These are not particularly long, nor much convoluted, and lie along the anterior edge of the broad ligament. The ovaries are completely covered by a peritoneal coat superiorly, but by their ventral faces open into a spacious peritoneal pouch, open anteriorly, in the floor of which is the very considerable aperture of the *morsus diaboli*, surrounded by the expanded extremity of the Fallopian tube. This is not much fimbriated, and is externally prolonged to meet the external border of the ovary of the same side. On this surface of the ovary may be seen a few scars, probably due to the eruption of Graafian follicles, as well as a couple of small clavate processes which depend freely from it into the cavity of the pouch. Towards the outer part of the broad ligament, and lying anteriorly to the ovary and round ligament, is a large "hydatid of Morgagni" nearly the size of a pea.

The opening of the vagina into the urino-genital sinus by *two* distinct apertures seems to be characteristic (according to the statements of Owen[1] and Rapp[2]) both of the Anteaters and the Sloths, though Pouchet considered it in his specimen as "sans doute une anomalie" (*l. c.* p. 195). The latter author describes as the "uterus" what I have here considered to represent both uterus and vagina, whilst what he calls "vagina" is only so in a functional sense, being morphologically the urino-genital canal. Rapp also describes these animals as having a single uterus with two *ora* ("*einfache Gebärmutter mit doppeltem* (*rechten und linken*) *Muttermund*," *l. c.* p. 104). Nevertheless I see no reason for doubting the view adopted by Prof. Owen, that the genital tube above the urethral opening represents in reality both uterus and vagina.

The presence of a vaginal septum, a remnant of the coalescence of the primitively paired Müllerian ducts, in *Myrmecophaga* is a peculiarity shared, judging from Owen's account, by the genus *Cholœpus*[3] only amongst other families of Edentates.

In the Indian Elephant there is, at least sometimes, a similar but more perfect septum dividing into lateral halves not only the vagina, but the uterus (here provided with a distinct *os uteri*) also[4]. In other cases this disappears completely, except externally, forming then the so-called "hymen" of Miall and Greenwood.

In the genus *Lagostomus*, on the other hand, as first described by Prof. Owen[5], the accuracy of whose statement I have lately had an opportunity of verifying, this median septum is developed along the proximal (uterine) part of the vagina, instead of the distal (external) as in *Myrmecophaga*[1].

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[1] Anat. Vert. iii. p. 690.

[2] *L. c.* p. 102.

[3] "In the Unau (*Bradypus didactylus*) the rudiment of a uterine septum appears as a longitudinal ridge from the inner surface of the anterior wall in the unimpregnated state: in this species also the same condition having been already noted in *Bradypus tridactylus*], the utero-vaginal canal communicates in the virgin animal by two distinct orifices with the short urogenital tract." Anat. Vert. iii. p. 690.

[4] M. Watson, "On the Anatomy of the Female Organs of the Proboscidea," Trans. Z. S. xi. p. 116 &c. pl. xxii. fig. 1.

[5] P. Z. S. 1839, p. 177; Anat. Vert. iii. p. 686.

As Pouchet, though describing the two apertures, does not mention any median septum, it is possible that this vaginal septum may disappear, as there seems to be good reason for supposing that it does in *Elephas indicus*, in the gravid state. The penis in *Myrmecophaga* is so small that during coitus it is, I expect, entirely contained in the urino-genital tube, and does not enter the vagina, as is also the case in *Elephas*; the disappearance of the vaginal septum can therefore hardly be due, in this species at least, to the non-*virgin* condition of any particular female.

4. As regards other points, I may mention that the external and internal iliac arteries come off separately, as in many other mammals[2], there being no common iliac arteries.

As in *Manis tridentata* as described by Rapp[3], the chevron bones in the tail contain a curious caudal *rete mirabile*, composed of both venous and arterial elements, which completely surrounds, as in a sheath, a central artery of large size, which is the direct continuation onwards of the abdominal aorta, and gives off here no branches at all to the *rete*. The arterial elements of this *rete* are derived from several small trunks on each side, which arise from the caudal artery beyond the origin of the internal iliacs, and then break up into a number of more or less parallel, rarely anastomosing, branches, mixed up with which are similar venous trunks. A similar *rete* occurs in *Tamandua*, and also, as I am informed by Prof. Flower, in the Spider Monkeys of the genus *Ateles*.

The paired eyelids are very small, and hardly exist as special organs; there are no eyelashes. The third eyelid, on the other hand, is very large and well-developed. It contains a large cartilage of concavo-convex shape; on the internal surface of this eyelid, just below the inferior border of the contained cartilage, opens the minute aperture of the Harderian gland, which is very large, almost completely surrounding the orbit, and concealing the much more minute lachrymal gland. As described and figured by Pouchet, it consists of three chief lobes.

As already suggested by Chatin, I have little doubt that it is the Harderian gland that has been described by Cuvier (Anat. Comp. 2me éd. iv. part 1, pp. 430, 431) and Owen (*l. c.* pl. xl. fig. 3 *b*) in *Cycloturus* as a salivary gland opening into the mouth.

Clavicles are frequently supposed to be absent in the Great Anteater, though present as rudiments in *Tamandua*, and well developed in *Cycloturus*[1].

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[1] A similar condition of things to that here described in the genus *Myrmecophaga* occurs sometimes, it may be observed, as a malformation, known as "*vagina duplex et uterus simplex*," in the human female, the vagina being more or less completely divided into two chambers by a median septum, and opening externally by *two* quite separate orifices. *Cf.* a paper by Dr. T. Matthews Duncan, Journ. Anat. Phys. i. pp. 269–274, and Dr. Morrison Watson's paper, "The Homology of the Sexual Organs illustrated by Comparative Anatomy and Pathology," *l. c.* xiv. pp. 60–62.

[2] *Cf* P. Z. S. 1881, p. 188.

[3] *L. c.* p. 92.

In the larger specimen of the two examined by me I find, however, a distinct one present on each side, lying in the muscles, about an inch long, nearly straight, of flattened form, with one end cylindrical. Similar ones were also present, closely attached to the sternum, but of smaller size, in the second specimen. Rapp (*l. c.* p. 40) found a rudimentary cartilaginous one in *Myrmecophaga*, though he (erroneously) denies one to *Tamandua*. There is also an accessory ossicle developed at the head of the fibula, as in some of the fossil forms.

In the anterior *cornu* of the hyoid bone, I find in both specimens *three* distinct ossifications[2]. The proximal of these is a small nodule of bone, ·3 inch long, articulating below with the basihyal; it is called the "apohyal" by Pouchet, but, according to the nomenclature now ordinarily employed, must really be the cerato-hyal[3]. The other two long curved ossifications of the anterior *cornu* must therefore be the epi- and stylo-hyals respectively.

Both Rapp (*l. c.* p. 61) and Pouchet ('Mémoires,' p. 95, pl. xii. figs. 1–3) describe the posterior cornu as articulating externally with the anterior one. But in neither of my specimens can I find any evidence of such a joint, as the two *cornua*, when in their undisturbed condition, are separated by a considerable space, in part occupied by a muscle (the *intercornualis*, Owen, *l. c.* p. 127); and in the cleaned bones I also find it impossible, without violence, to bring the two arches into such contact together. In *Tamandua*, though there is a distinct ligament between the two arches, they are nevertheless similarly separated; and neither Duvernoy[4], who dissected this species, nor Owen, in his account of *Myrmecophaga*, allude to any such interarticulation existing; Owen's figure (pl. xxxix. fig. 2) indeed clearly shows the two cornua separated by the *intercornualis* muscle, as also observed by me (*cf.* Plate XV. fig. 1, *int*).

At the place where the three main ducts of the submaxillary glands of each side converge to become intimately connected together by their walls, though they still remain quite separate tubes, they are covered by a mass of muscle which forms a bulb-like swelling for an extent of 1¾ inch on the inferior aspect of the conjoined ducts (Plate XV. fig. 1). It is this mass of muscles that has been described by Owen (*l. c.* p. 126) as the "*constrictor salivaris*," a name adopted by Pouchet subsequently.

The external aspect of the ducts is also, for the posterior half inch of this space, covered by a thick muscular coating, so that in this portion the three ducts are encircled by a broad ring of muscular fibres. These fibres arise from the anterior edge of the anterior hyoid cornu, on each side of the junction of the stylo- and epihyal bones; running then forwards and outwards, they pass *beneath* and to the outside of (in a sternal view) the conjoined ducts, and then ascend to fan out and form the muscular bulb. The more anterior of these fibres are inserted into the internal and upper part of the combined ducts, and cease there. The most posterior, on the contrary, completely encircle the ducts, running inwards over the ducts, and then, recurving on themselves, ascend on the deep aspect of the ducts, to be inserted on the stylohyal bone for the greater part of its length, not, however, extending to either of its extremities. Along the anterior (free) border of the ascending part, at the point where it is in contact with the ducts and the deep part of their muscular ring, is developed a strong tendinous edge (*s.h. m. t*), the "commissural tendon" of Owen.

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[1] 'Osteology of the Mammalia,' by W. H. Flower, p. 235: London, 1876.

[2] The accounts given by different authors of the compositon of the hyoid bones in the Anteaters differ considerably *inter se*. *Cf.* Pouchet, 'Mémoires,' pp. 93–95.

[3] In *Tamandua* I am unable to find any corresponding ossification, though both the epi- and stylo-hyals are well developed.

[4] Mém. Soc. Hist. Nat. Strasbourg, 1830; and Cuvier's Anat. Comp. 2me éd. iv. part 1, p. 476.

The muscular fibres inserted on this and attached to the stylohyal (ceratohyal of Owen's nomenclature) are described by that author as the "*cerato-hyoideus*," whilst Pouchet more correctly applies to it the name of "*stylo-hyoideus*," the rest of the muscular arrangement here described forming, as already stated, the "*constrictor salivaris*" of both authors.

It appears to me that the whole muscle may be more correctly considered as the *stylo-hyoideus*, which has developed this remarkable course round the submaxillary ducts in order to aid the ejaculation of the saliva therein contained by the constriction, on contraction of the muscle, of their walls between the circularly-disposed fibres surrounding them and the tendon developed on its anterior margin.

In the genus *Tamandua*[1] (Plate XV. fig. 2) there is no special muscular envelope developed round the ducts in this position. The most posterior fibres of the *mylo-hyoideus* (*m.h'*) arise from the posterior end of the stylo-hyal bone, running inwards and forwards, and blending internally with the genio-hyoid. To this point also run *backwards* and inwards the fibres of a narrow flattened muscle (*s.h. m*), which crosses the hyoid origin of the mylo-hyoid superficially, and, as it arises from the stylo-hyal bone, must be considered to represent a *stylo-hyoideus*. At the point where it meets the genio-hyoid and mylo-hyoid, all three muscles become closely connected together, the stylo-hyoid developing here an anterior tendinous edge (*s.h. m. t*). Between this tendon and the conjoined mylo-hyoid and genio-hyoid run the three ducts of the submaxillary gland, so that contraction of these muscles here also serves a purpose similar to that produced by the more specialized arrangement found in the larger species.

[P.S. July 13, 1882.—I have found the disposition of the salivary ducts and the arrangement of the *stylo-hyoideus* muscles exactly the same as those here described in a third specimen of *Myrmecophaga* just dead.—W. A. F.]

EXPLANATION OF PLATE XV.

Fig. 1. Dissection of the left suprahyoidean region of *Myrmecophaga jubata*, to show the course and relations of the *stylo-hyoideus* muscle.

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[1] *Cf.* Duvernoy, Mém. Strasb. 1830, "Mémoire sur la langue" &c., p. 3.

s.h, stylo-hyal; *e.p*, epihyal; *c.h*, cerato-hyal; *b.h*, basihyal; *t.h*, thyro-hyal; *s.h.m'*, origin of the *stylo-hyoideus*; *s.h. m*, its insertion; *s.h. m. t*, its tendinous edge (this, being deep of the muscle and ducts, is diagrammatically represented by a dotted line); *m.h*, *m.h'*, *mylo-hyoideus*, cut and reflected; *s.g*, *sterno-glossus* (cut short); *g.h'*, *genio-hyoideus*, at its origin, cut short and reflected; *h.g*, *hyo-glossi*; *ep*, *epipharyngeus* (Owen); *hy*, *hyopharyngeus* (Owen); *int*, intercornualis; 1, 2, 3, the three ducts of the submaxillary gland, converging to be surrounded by the *stylo-hyoideus*.

2. The same parts in *Tamandua tetradactyla*, enlarged. The letters as before, except *s.h.m*, *stylo-hyoideus* muscle, with its anterior tendinous edge (*s.h.m.t*), blending here with the mylo- (*m.h.*) and geniohyoid (*g.h*) muscles, and surrounding the three submaxillary ducts (*s.m.d*), which are cut short and reflected; *m.h'*, hyoid origin of the mylo-hyoid.
3. Diagram to show the openings into the mouth of the three ducts of the submaxillary gland in *Myrmecophaga*. *a*, *b*, the two ducts from the more posterior parts of the gland, opening together; *c*, the third duct, from the cervical part, opening posteriorly to the other two ducts.

2. List of the Birds sent home by Mr. Joseph Thomson from the River Rovuma, East Africa. By Captain G. E. Shelley.

[Received February 25, 1882.]

(Plate XVI.)

Mr. Thomson is well known as one of the most successful East-African explorers. On him devolved the task of carrying through the expedition in which Mr. Keith Johnston lost his life; and no praise can be too strong for the manner in which he fulfilled his mission. Like all successful African travellers, he has again returned to the Dark country, this time to explore the river Rovuma and to report on the value of the coal-fields said to exist in that valley; and an interesting account of his journey has been given by himself (Proc. R. Geogr. Soc. 1882, p. 65).

The Rovuma runs from the south-west into the sea at 10° 30′ S. lat.; and Mr. Thomson explored this valley to nearly 37° E. long. During this journey the present collection of birds was made, whereby two interesting new species are added to the African Avifauna.

1. Astur tachiro (*Daud.*).
2. Falco minor, *Bp.*
3. F. dickersoni, *Sclat.*
4. Coracias caudata, *Linn.*
5. Halcyon orientalis, *Peters.*
6. Merops dresseri, sp. n.
7. Melittophagus bullockoides (*Smith*).
8. M. pusillus (*Müll.*).
9. Upupa africana, *Bechst.*
10. Irrisor erythrorhynchus (*Lath.*).
11. Rhinopomastes cyanomelas (*Vieill.*).
12. Cinnyris microrhynchus, *Shelley.*
13. C. gutturalis (*Linn.*).
14. Motacilla vidua, *Sundev.*
15. Turdus libonyanus, *Smith.*
16. Cossypha heuglini, *Hartl.*
17. Crateropus plebejus (*Rüpp.*).
18. Oriolus notatus, *Peters.*
19. Pachyprora molitor (*Hahn & Kust.*).
20. Bias musicus (*Vieill.*).
21. Platystira pellata, *Sundev.*
22. Muscicapa cærulescens, *Hartl.*
23. Erythrocercus thomsoni, sp. n.
24. Trochocercus cyanomelas (*Vieill.*).
25. Smithornis capensis, *Smith.*
26. Parus niger, *Vieill.*
27. Melanornis ater, *Sundev.*
28. Buchanga assimilis (*Bechst.*).
29. Telephonus erythropterus (*Shaw*).
30. Laniarius cubla (*Shaw*).
31. L. boulboul (*Shaw*).

32. L. quadricolor, *Cass.*
33. L. sulphureipectus (*Less.*).
34. L. poliocephalus (*Licht.*).
35. Nicator gularis, *Hartl. & Finsch.*
36. Prionops talacoma, *Smith.*
37. Sigmodus tricolor (*Gray*).
38. Lamprocolius chalybeus, *Hempr. & Ehr.*
39. Uræginthus phœnicotis (*Swains.*).
40. Hypargus niveiguttatus (*Peters*).
41. Gallirex chlorochlamys, *Shelley.*
42. Pogonorhynchus melanopterus (*Peters*).
43. Dendropicus fulviscapus (*Ill.*).

ERYTHROCERCUS THOMSONI, sp. n. (Plate XVI. fig. 2.)

Upper parts olive-yellow; rump and upper tail-coverts rufous washed with yellow; tail rufous, the feathers slightly washed with yellow on their edges and crossed by a broad black subterminal band; in one specimen the outer feather alone is without any black band, and the next feather is only banded on the outer web, with a black spot on the inner one; in the second specimen the four outer feathers on each side are without any black at all; rictal bristles black, forehead rather narrowly margined with brownish buff; lores and in front of the eye white (but the state of the skins prevents me from seeing the limits of this colour on the sides of the head); wings dark brown, all the feathers broadly edged with olive-shaded yellow excepting towards the ends of the primaries; entire under surface bright yellow; under wing-coverts yellow, basal portion of the inner webs of the quills rather narrowly edged with rufous buff. Bill—upper mandible brown, lower one flesh-colour. Legs and claws pale brown. Total length 4·5 and 4·1 inches; culmen 0·25; wing 1·9 and 1·8; tail 2·1; tarsus 0·65.

On referring to Mr. Sharpe's Cat. B. Brit. Mus. iv. p. 208, pl. 9, we at once recognize *Erythrocercus livingstonii* as the nearest ally of this new species; and I shall propose the following addition to his key of this genus:—

a. Tail uniform, without a bar: to include *C. macalli* and *C. livingstonii.*

b. Tail with a broad black subterminal bar: *C. thomsoni.*

The present species further differs from *C. livingstonii* in the crown and sides of the head being the same colour as the back, the forehead alone being margined with brownish buff, and the chin scarcely shows a trace of white.

MEROPS DRESSERI, sp. n. (Plate XVI. fig. 1.)

Crown and nape fawn colour, the tips of the feathers slightly washed with greenish yellow; remainder of the upper parts green; the basal portion of the inner margins of the quills pale fawn colour; the primaries have the remainder of their inner margins and their ends dusky black; the secondaries are rather broadly tipped with black, with the exception of the inner feather, which, like the longer scapulars and upper tail-coverts, is washed with blue towards its end; two centre tail-feathers green, gradually shading into black on their long narrow ends, which are slightly widened at the tips; remainder of the tail square, the feathers with broad black end, narrowly tipped with white on the outer ones, and rather more broadly so with blue as they approach the centre pair; on the sides of the head a broad black band runs through the eye, margined beneath by a rather narrower pale blue one; chin and throat fawn colour, with the ends of the feathers slightly more strongly washed with greenish yellow than the crown; remainder of the under surface green, with the feathers of the abdomen and under tail-coverts washed with blue towards their edges; under surface of the quills brown, the basal portion of their inner margins and the under wing-coverts pale fawn colour; under surface of the tail ashy brown, with a black terminal bar. Bill and legs black. Total length 9·8 inches, culmen 1, wing 3·1, tail 5·5, tarsus 0·4.

I have named this bird after my friend Mr. Dresser, who is about to publish a monograph of the *Meropidæ*, in acknowledgment of the valuable services rendered to ornithology by his large work on the Birds of Europe.

3. A second List of Birds recently collected by Sir John Kirk in Eastern Africa. By Captain G. E. SHELLEY.

[Received February 25, 1882.]

(Plate XVII.)

The collection of which the present paper treats was made by Sir John Kirk chiefly in the neighbourhood of Mamboio, on the eastern slopes of the mountain-range which separates Ugogo from the Zanzibar Province, but also contains some specimens from Ugogo country and two from Brava in South Somali-land, 1° N. lat.

This paper is intended as a supplement to my former one (P. Z. S. 1881, pp. 561–602).

1. CIRCAËTUS CINEREUS.

Circaëtus cinereus, Vieill.; Shelley, P. Z. S. 1881, p. 562.

Brava, in South Somali-land.

2. FALCO CUVIERI.

Falco cuvieri, Smith; Shelley, P. Z. S. 1881, p. 562.

Ugogo.

The head quarters of this Hawk is probably the unexplored regions of Central Africa.

This specimen, I presume, from its size is a female. In colouring it is almost identical with my specimen from Lamo, but is, if any thing, a shade duller.

Lamo, ♂? Total length 10·4 inches, wing 8.7, tail 4·9, tarsus 1·30
Ugogo, ♀? „ 12·2 „ „ 9·3, „ 5·25, „ 1·35

3. ASTURINULA MONOGRAMMICA.

Asturinula monogrammica (Temm.); Shelley, P. Z. S. 1881, p. 562.

Ugogo.

4. ACCIPITER MINULLUS.

Nisus minullus, Finsch & Hartl. Vög. Ostafr. p. 85; Fischer & Reichenow, J. f. O. 1878, pp. 251, 272.

Accipiter minullus (Daud.); Sharpe, Cat. B. Brit. Mus. i. p. 140.

Mamboio.

I have also a specimen from Rabbai near Mombas, collected by the Rev. T. Wakefield. It ranges from Abyssinia southward throughout East and South Africa.

5. MELIERAX POLIOPTERUS.

Melierax poliopterus, Cab. in v. d. Decken, Reisen, iii. p. 40; Finsch & Hartl. Vög. Ostafr. p. 90; Sharpe, Cat. B. Brit. Mus. i. p. 88.

Brava in South Somali-land.

This species is, as far as we yet know, exclusively East-African. The type came from the Umba river in the interior, and is I believe the only other specimen known. South of the Zambesi it is represented by the closely allied *M. canorus*.

6. MELIERAX NIGER.

Nisus niger, Finsch & Hartl. Vög. Ostafr. p. 89.

Melierax niger (Vieill.); Sharpe, Cat. B. Brit. Mus. i. p. 91.

Micronisus niger, Cab. J. f. O. 1878, p. 242,

Mamboio.

This species ranges over the whole of South and East Africa, extending northward into Abyssinia and Kordofan, and thence crosses the continent to Senegal and Casamanse.

7. GLAUCIDIUM CAPENSE.

Glaucidium capense (Smith); Shelley, P. Z. S. 1881, p. 563.

Mamboio.

This is the most northern limit yet recorded for this species.

8. SYRNIUM WOODFORDI.

Syrnium woodfordi (Smith); Shelley, P. Z. S. 1881, p. 561.

Ugogo.

9. CAPRIMULGUS EUROPÆUS.

Caprimulgus europæus, Linn.; Finsch & Hartl. Vög. Ostafr. p. 117.

Mamboio.

The Common European Goatsucker ranges throughout the whole of Africa, but is everywhere migratory.

10. COSMETORNIS VEXILLARIUS (Gould); Shelley, P. Z. S. 1881, p. 564.

Mamboio.

With regard to its range as given by me *l. c.*, instead of Zambesi read Limpopo as its southern known limit in Eastern Africa.

11. PSALIDOPROCNE HOLOMELÆNA.

Psalidoprocne holomelæna (Sundev.); Sharpe, P. Z. S. 1870, pp. 288, 320.

Mamboio.

New to East Africa. The range of this species is very uncertain, as it is found on the Gold Coast and in South Africa from Cape Colony to Natal, but has not previously been recorded from any portion of South Tropical Africa.

12. HAPALODERMA VITTATUM, sp. n.

Very similar in size and general colouring to *H. narina*, but differs as follows: bill smaller and much narrower, scarcely more than half the breadth; head darker and of a more olive-green; neck entirely surrounded by a bluish-bronze collar; wing-coverts with narrow distinct white bars not freckled with white as in *H. narina*; dark portion of the tail violet-blue, very partially edged with green; white portion of the tail very distinctly barred with bluish black. Culmen 0·6, wing 5, tail 7, tarsus 0·65.

Hab. Mamboio.

The only specimen is in extremely bad condition, so much so that I cannot say how far the blue may extend on the throat; but it appears to be only a narrow ring round the neck. The bars on the wing-coverts and the colouring of the tail, especially the barring of the white portion, are sufficient characters to distinguish it at a glance from *H. narina* and *H. constantia.*

13. RHINOPOMASTES CABANISI.

Irrisor cabanisi, De Fil.; Heugl. Orn. N.O.-Afr. p. 219.

Mamboio.

New to East Africa. This species is closely alied to *R. minor*, but may be readily distinguished by the white patch on the primaries, which is not present in *R. minor*. It ranges from the Upper White-Nile district to Mamboio.

14. SAXICOLA PLESCHANKA (Lepech.).

Saxicola morio, Seebohm, Cat. B. Brit. Mus. v. p. 372.

Mamboio.

New to East Africa. It ranges in Africa; from Egypt to Mamboio, and possibly occurs in Algeria.

15. MOTACILLA LONGICAUDA, Rüpp.

Ugogo.

New to East Africa. This species ranges from Abyssinia, where it was first collected by Dr. Rüppell, to Durban in Natal.

16. GRAUCALUS PECTORALIS.

Graucalus pectoralis, Jard.; Sharpe, Cat. B. Brit. Mus. iv. p. 29.

Mamboio.

New to East Africa. It inhabits the whole of Africa between 15° N. lat. and 22° S. lat.

17. SIGMODUS TRICOLOR.

Sigmodus tricolor (Gray); Shelley, P. Z. S. 1881, p. 581.

Mamboio.

Five specimens, three with white on the wing, and two without.

18. SIGMODUS SCOPIFRONS.

Sigmodus scopifrons, Peters, Shelley, P. Z. S. 1881, p. 582.

Mamboio.

19. EURYCEPHALUS RUEPPELLI, Bp.

Eurycephalus anguitimens, Cab. J. f. O. 1878, p. 225 (?); Fischer & Reichenow J. f. O. 1879, p. 347 (?); Shelley P. Z. S. 1881, p. 582.

Mamboio, Ugogo.

I suspect that Drs. Cabanis, Fischer, and Reichenow fell into the same error as I did *l. c.*, and overlooked the white rump which separates this species from the South-African *E. anguitimens*. At any rate my reference *l. c.* should be cancelled. This species ranges from Shoa, about 9° N. lat., where it was collected by Dr. Rüppell, to Mamboio and Ugogo, about 7° S. lat.

20. DILOPHUS CARUNCULATUS (Gm.).

Mamboio.

New to East Africa. This species ranges from Abyssinia throughout East and South Africa.

21. AMYDRUS MORIO (Linn.).

Amydrus rueppelli, Shelley, P. Z. S. 1881, p. 583.

Mamboio.

I have come to the conclusion that *A. rueppelli*, Verr., is not specifically distinct from *A. morio*: in colouring I can detect no difference; but one of M. Verreaux's specimens in my own collection is slightly larger than sixteen specimens from East and South Africa, the Natal ones being generally the smallest and the East-African ones intermediate; but this slight variation in size does not in my opinion constitute a specific character. In Natal specimens three of those compared belong to what I consider a variety, differing from the others in having the greater portion of the primary-coverts rufous, and in the rufous of the quills extending onto the outer secondaries.

This species ranges from Abyssinia, throughout East Africa to Natal, and thence to the Cape of Good Hope.

22. TEXTOR DINEMELLI.

Textor dinemelli, Horsf.; Finsch & Hartl. Vög. Ostafr. p. 386; Cab. J. f. O. 1878, p. 233; Fischer & Reichenow, tom. cit. pp. 299, 351.

Mamboio.

This species ranges from Shoa, in about 10° N. lat., to Mamboio, in about 7° S. lat.

23. **PENTHETRIA ARDENS.**

Penthetria ardens (Bodd.); Finsch & Hartl. Vög. Ostafr. p. 423.

Mamboio and Ugogo.

New to East Africa. From the above-mentioned localities it ranges southward into Natal and Caffraria, and westward to the Loango coast.

24. **AMBLYOSPIZA UNICOLOR.**

Amblyospiza unicolor, Fischer & Reichenow; Shelley, P. Z. S. 1881, p. 589.

Mamboio.

This is the most southern limit we can yet accord to this species.

25. **FRINGILLARIA ORIENTALIS**, sp. n.

Very similar to *F. major*, Cab., but smaller, with the bill and legs slightly longer and stouter; the eyebrow and white central band on the crown broader and more distinctly marked. Total length 5·7 inches, culmen 0·55, wing 3·2, tail 3·1, tarsus 0·8.

Mamboio.

In my opinion this is only one of three races of a single species; but I have here described it as a new species, as many ornithologists may prefer to consider it such. By the term race I intend to indicate that the form is so nearly allied to one or more others that, in my opinion, further research is sure to discover intermediate forms which may be placed as well with one as with the other.

The three races are:—

1. *F. cabanisi*, Reichenow, J. f. O. 1875, p. 233, pl. 2. figs. 2, 3. *Hab.* Cameroons.

This race is only known to me by the description and plate *l. c.*

2. *F. orientalis*. *Hab.* Mamboio.

3. *F. major*, Cab. J. f. O. 1880, p. 349, pl. 2. fig. 2. *Hab.* Angola.

As regards *F. cabanisi*, Bocage, Orn. Angola, p. 371, I have a specimen in my own collection of this form from Caconda. It differs from the plate given by Dr. Cabanis (*l. c.*) in the central stripe on the crown being white, not grey, and in the feathers of the mantle being more striped and less scale-like, their dark centres generally extending quite to the tips of the feathers.

26. **MIRAFRA TORRIDA**, sp. n. (Plate XVII.)

Upper parts rufous-brown, with dark central stripes to the feathers of the crown, nape, and greater portion of the back; rump and upper tail-coverts with obsolete shaft-stripes; some of the feathers of the mantle very partially edged with buff. Wings rufous, the coverts and secondaries edged with buff; median and greater coverts partially barred with black; secondaries somewhat similarly barred, and with a waved black line encircling each feather near the edge; primaries browner, without black markings, and broadly edged externally and internally with rufous. Tail, two centre feathers rufous; outer tail-feathers, with the exception of an inner edging, and the outer webs of the next pair fawn colour; remainder of the tail dark brown. Underparts rufous buff, as well as an eyebrow, cheeks, and ear-coverts: sides of the head mottled with rufous; sides of the neck similar in colouring to the back; middle of the throat slightly mottled with rufous; lower throat and crop strongly mottled with rufous-brown, and with partial black central stripes to a few of the feathers; under surface of the quills brown, with broad rufous edges to the inner webs; under wing-coverts rufous-buff; lower half of the bill flesh-colour, remainder shading into dark brown towards the culmen; legs flesh-colour. Total length 5·7 inches, culmen 0·5, wing 3·1, tail 2·4, tarsus 0·95.

Hab. Ugogo.

This seems to be a very distinct species of Lark; and I cannot find any description that suits it. Looking at Mr. Sharpe's Key to the Species of *Mirafra* found in Africa (P. Z. S. 1874, p. 638), it appears to be different at once by its entirely rufous colour and the two rufous central tail-feathers. Of the species mentioned by Mr. Sharpe, it would appear to have its nearest ally in *M. cheniana*; but its entirely rufous colour above and the fawn-coloured outer tail-feathers distinguish it.

27. TURACUS MUSOPHAGUS.

Corythaix musophaga, Dubois; Finsch & Hartl. Vög. Ostafr. p. 475.

Mamboio.

This species is here recorded for the first time from East Africa north of the Zambesi. It ranges throughout South Africa, and extends northward on the east coast to Mamboio.

28. TURACUS LIVINGSTONII.

Turacus livingstonii, Gray, P. Z. S. 1864, p. 44.

Corythaix livingstonei, Finsch & Hartl. Vög. Ostafr. p. 476, pl. 8; Fischer & Reichenow, J. f. O. 1880, pp. 141, 189.

Ugogo.

This species ranges from the Mombas district, where it has been procured by Dr. Fischer, to Delagoa Bay, and crosses the continent to Benguela.

29. CUCULUS CANORUS.

Cuculus canorus, Linn.; Sharpe, P. Z. S. 1873, p. 580.

Mamboio.

The single specimen sent home by Sir John Kirk is fully adult but remarkedly small; total length 11·7 inches, culmen 0·8, wing 8, tail 7, tarsus 0·8. It agrees well in colouring with British and Abyssinian specimens with which I have compared it, as also with Mr. Sharpe's description *l. c.*, excepting that it shows no signs of a greenish gloss on the back. *C. canorus* ranges throughout Africa, but is everywhere migratory.

30. CUCULUS SOLITARIUS.

Cuculus solitarius, Steph.; Sharpe, P. Z. S. 1873, p. 582.
Cuculus heuglini, Hartl. Abhandl. nat. Ver. Brem. vii. p. 113.

Mamboio.

The four specimens sent me by Sir John Kirk I have compared with South-African examples and with one from Lado collected by Dr. Emin Bey and referred to *C. heuglini* by Dr. Hartlaub *l. c.*, and can find no difference between them. This species ranges throughout Africa south of about 8° N. lat.

31. TURTUR LUGENS.

Turtur lugens (Rüpp.); Shelley, P. Z. S. 1881, p. 596.

Mamboio.

This is its southern limit as yet known.

32. FRANCOLINUS INFUSCATUS.

Francolinus infuscatus, Finsch & Hartl. Vög. Ostafr. p. 578.
Pternistes infuscatus, Cab. J. f. O. 1878, p. 214.

Mamboio.

This species is confined to East Africa, and was hitherto only known by the type specimen, which was collected by the Baron von der Decken near Lake Jipe, which lies about 100 miles north-west of Mombas, and by a specimen procured by Herr Hildebrandt also in the Teita country.

33. HOPLOPTERUS SPINOSUS.

Hoplopterus spinosus (Linn.); Fischer & Reichenow, J. f. O. 1879, pp. 296, 301, 337.

Mamboio.

This Plover ranges in Africa from Mamboio to the mouth of the Nile, and crosses the continent to Senegal.

34. ANAS ERYTHRORHYNCHA.

Anas erythrorhyncha, Gm.; Finsch & Hartl. Vög. Ostafr. p. 808.

Mamboio.

This species ranges throughout South Africa, extending northward on the east coast to Zanzibar, and is also found in Madagascar.

March 21, 1882.

Prof. W. H. Flower, LL.D. F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of February 1882:—

The total number of registered additions to the Society's Menagerie during the month of February was 59, of which 22 were by presentation, 26 by purchase, 3 by birth, 2 were received in exchange, and 6 on deposit. The total number of departures during the same period, by death and removals, was 89.

The most noticeable additions during the month of February were as follows:—

1. Four Warty-faced Honey-eaters (*Xanthomyza phrygia*), and
2. Two Musk-Ducks (*Biziura lobata*), purchased February 8th.

Both these Australian species are new to the Society's Collection; and, so far as I know, examples of them have not been previously brought alive to Europe.

3. A young Tapir, born in the Gardens February 12th, and thriving well, is the produce of our male *Tapirus roulini* (received May 25th, 1878) and the large female *Tapirus americanus* from Paraguay, received January 16th, 1873. It is the first of the genus bred in the Society's Gardens.

4. A female Mule Deer (*Cervus macrotis*) from the Western United States, presented by Dr. J. D. Caton, C.M.Z.S., and received February 15th.

Thanks to Dr. Caton's kind exertions we have now a fine pair (besides an odd male) of this beautiful Deer, and shall, I trust, succeed in breeding them. The female just received is in excellent health and very tame.

Mr. J. E. Harting exhibited a mummified bird forwarded by Mr. George Holland of Swansea, and received by him from an island on the coast of Peru, whence it was brought home by the master of the ship 'Nero.' It was evidently a young Gannet, and most probably referable to *Sula fiber*, a species common on the South-Pacific and South-Atlantic coasts.

The island in question appeared to be a great breeding-haunt of sea-fowl; and the deposit of guano there was very considerable. The bird was found in a sitting posture completely buried in the guano at a great depth. It had accordingly been so well preserved as to be easily recognizable, although it must have been buried for some considerable time. Three eggs exhibited, in much the same condition, were obtained at the same time and place. One was probably the egg of a Gull, the others those of a Tern.

Mr. Sclater stated that in the course of some lectures lately given at the Royal Institution on the geographical distribution of animals, he had found it convenient to coin a term for the designation of a type of animal life the *absence* of which was characteristic of a particular district or region. This term he proposed should be "Lipotype"[1].

Thus the order Insectivora and the families Bovidæ and Viverridæ were "lipotypes" of the Neotropical Region; the Bears (Ursidæ) and the Deer (Cervidæ) of the Æthiopian Region; and the Woodpeckers (Picidæ) and Vultures (Vulturidæ) of the Australian Region.

The term was of course more specially required and more appropriate in cases where the "lipotype" was a form that might *primâ facie* have been expected to occur in the Region or district in question but was remarkable by its absence.

Dr. Günther, F.R.S., exhibited a flat skin of a very remarkable pale sandy-coloured variety of the Leopard (*Felis pardus*), from the Matabele district, South Africa, and pointed out its superficial resemblance in colour to the Woolly Cheetah (*Felis lanea*, Sclater).

Dr. Günther also exhibited and made remarks upon the shell of a new Tortoise of the genus *Geoemyda* from Siam, which he proposed to describe as new at a subsequent meeting.

Mr. R. Bowdler Sharpe exhibited a specimen of a Goldfinch from Hungary, which had been sent to him by Dr. J. von Madarasz of the Museum of Buda-Pest, and which had been described by that gentleman as *Carduelis elegans albigularis*. Mr. Sharpe pointed out that a variety of the Goldfinch with a white throat was by no means unplentiful in England, and that a figure agreeing with the specimen now exhibited would be found in the late Mr. Dawson Rowley's 'Ornithological Miscellany' (vol. i. p. 91, fig. 3 in the plate).

The following papers were read:—

1. On some Points in the Anatomy of *Pterocles*, with Remarks on its Systematic Position. By Hans Gadow, Ph.D., C.M.Z.S.

[Received February 18, 1882.]

Amongst the unfinished manuscripts of the late Prof. A. Brandt, in St. Petersburg, there were some notes by him preparatory to a discussion on the anatomical characters of the *Pterocletes*. His son, now Professor in Charkow, was good enough to put these notes into my hands, while others were distributed amongst those naturalists who specially interested themselves in the other different groups to which that distinguished naturalist had devoted some of his attention. The Society will see, therefore, that it was with peculiar pleasure that a specimen of *Pterocles arenarius* in the flesh was received by me during the short time that I was intrusted with the duties of its prosector during his absence from England[1].

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[1] λείπω, *deficio*, et τύπος, *forma*.

INTEGUMENT.

The arrangement and form of the feather-tracts in *Pterocles* and *Syrrhaptes* is almost the same as that in the Pigeons; but too much weight has been laid upon the peculiar bifurcated shape of the shoulder part of the spinal tract. Nitzsch himself, in his description of the Gallinacei, mentions that a very similar arrangement of the shoulder-tract we meet with in *Numida* and *Penelope* and partly in *Tetrao* and *Crypturus*. He points out that in this respect *Numida* in particular approaches the Columbine type.

Again, the Charadriidæ and many Laridæ present nearly the same type of feather-tracts, although they differ in the lower and ventral part of the spinal tract.

The contour-feathers of *Pterocles* possess a very small after-shaft, whilst this organ, although likewise small, is present in the Limicolæ and Gallinacei, but altogether absent in the Pigeons.

The number of the rectrices and of the primaries is of no systematic importance in these birds, as will be seen from the following table:—

	Total number of quills.	Primaries.	Which of the primaries the longest.	Number of rectrices.
Pterocles	27–28	10	first	16
Pigeons	up to 25	10	second	12, 14, 16
Plovers	24–26	10	first	12
Fowls	22–29	10, 11	4th, 5th, 6th	10–20

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[1] Principal books and essays referred to in the text:—

W. K. PARKER. "On the Osteology of Gallinaceous birds and Tinamous," Trans. Zool. Soc. v. pp. 149–241.

A. H. GARROD. "On certain Muscles of the Thigh of Birds &c.", P. Z. S. 1873, pp. 626–677, and 1874, pp. 111–123.

——. "On the Disposition of the deep Plantar Tendons in different Birds," P. Z. S. 1875, pp. 339–348.

——. "On the Carotid Arteries of Birds," P. Z. S. 1873, pp. 457–472 (for *Pterocles* see p. 468).

——. "Nasal Bones of Birds," P. Z. S. 1873, pp. 33–38 (*Pterocles*, see pp. 36, 37).

NITZSCH. 'System der Pterylographie,' 1840.

E. BLANCHARD. "Caractères ostéologiques des Gallinacés ou Gallides," in Ann. Sciences Natur. sér. 4, tome vii. (1857), pp. 91–106, plates 10–12.

M. OUSTALET. "Monographie des Oiseaux de la famille des Megapodiides," *Op. cit.* sér. 4, tome x & xi. (1881).

H. GADOW. "Beiträge zur vergleich. Anat., Verdauungssystem d. Vögel," Jenaische Zeitschrift, 1879.

BOGDANOW. In 'Mélanges biologiques,' 1880, pp. 49–55.

D. G. ELLIOT. "A Study of the Pteroclidæ or Family of the Sandgrouse," P. Z. S. 1878, p. 233–264.

The *general coloration* of the Sand-Grouse is thoroughly protective, and is very distinctly marked throughout the genus by the dark crescent on the breast and the dark colour of the under surface of the wings. Though pronounced and apparently peculiar to the Sand-Grouse, a similar pattern is found in some of the Pigeons, as well as in the Plovers and in Grouse.

The *nestling plumage* of the Sand-Grouse consists of a thick downy cover with fine terminal hairs to each down-feather, much like that of the Plovers and Fowls, whilst the Pigeons, when hatched, are almost nude and are entirely devoid of downy feathers.

The *oil-gland* is present and quite naked in Sand-Grouse and Pigeons (in some Pigeons wanting), whilst in the Gallinacei and Limicolæ this organ is tufted.

In both form and structure the "tarsus" and the claws of the Sand-Grouse closely resemble those of the Gallinacei, but are remarkable for the tendency to suppression of the first or hind toe, which in *Syrrhaptes* is entirely aborted. This never occurs amongst the Pigeons and Fowls, but is a common feature in the Pluvialine tribe.

The *bill* and the *nostrils* of *Pterocles* are like the same parts in the Turnicidæ, which, like *Pterocles* and the Columbæ, are schizorhinal, whilst the Rasores proper are what Garrod termed holorhinal.

OSTEOLOGY.

As the osteology of *Pterocles* and *Syrrhaptes* has been fully described by Professors Parker and Garrod, it will be superfluous for me to do more than indicate some of the salient points. Prof. Parker says:—"There is no vomer in the *Syrrhaptes* to tie the two palatines together; and this is a sudden assumption of a columbaceous character." However, this is not of great importance, because most of the Tetraonidæ have also no vomer, or at least this bone is very much suppressed.

The skull certainly bears many striking affinities to the Columbæ. The *Syrrhaptes* keeps close to the Fowls in respect of its vertebral characters.

	Number of cervical vertebræ.	Dorsal.	Sacral.	Caudal.
Syrrhaptes	16	4	15	6
Pterocles arenarius..	15	5	15	7
Columba livia..	14	4	14	7
*Gallus**	16	4	15	6

"There is much that is Pigeon-like in the pelvis of the Grouse and the *Syrrhaptes*."

All the wing-bones, and in particular the humerus, strikingly resemble those of the Pigeons (see Garrod, P. Z. S. 1874, p. 255, fig. 1).

MUSCULAR SYSTEM.

I myself have examined specially only the muscles of the pelvic region and those of the hinder extremity. As regards the muscles of the shoulder-girdle I am indebted to Prof. Fuerbringer for the information that *Pterocles* approaches nearer to the Pigeons than to the Fowls.

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* Parker, *l. c.*

***Mm. iliaci externi* (*mm. glutei*).**—This group in *Pterocles* consists of only two muscles, an anterior and a posterior. Of these the latter is the larger; it arises from the broad latero-dorsal plane of the præacetabular part of the ilium, and is inserted close to the external trochanter of the femur. The iliac muscles have their nerve-supply from the crural plexus.

***M. iliacus internus*.**—This small muscle is comparatively long, as it arises from nearly the middle of the ventral aspect of the præacetabular ilium. It is inserted as usual, between the internal trochanter and the neck of the femur.

***M. sartorius*.**—Flat and very broad, from the greater part of the lateral and dorsal margin of the præacetabular ilium. The muscle is partly blended with the *m. ilio-tibialis* at the distal third of the thigh; the rest passes over the patella as a flat but nevertheless rather fleshy strip, and then extends into part of the head of the m. extensor digitorum communis. The muscle is supplied by nerves from one of the first branches of the crural plexus.

M. ilio-tibialis (m. quadratus femoris).—This muscle is rather feebly developed; it arises with an aponeurotic sheet, which superficially covers the mm. iliaci externi, and which also takes origin from the regio posttrochanterica of the ilium. The muscle is completely blended with the m. femoro-tibialis, with the m. gluteus posterior, and with the m. sartorius. It is inserted together with the tendon of the mesial and external part of the m. femoro-tibialis into the head and rest of the tibia. Nerve-supply from the crural plexus.

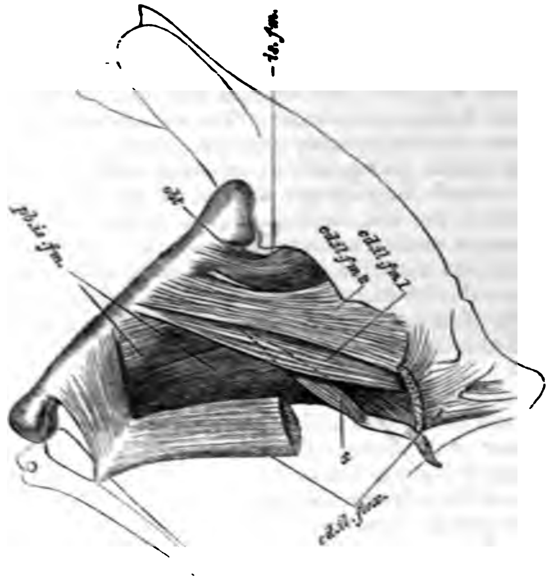
The *m. gluteus posterior* + *m. tensor fasciæ latæ* (m. tensor fasciæ latæ) arises rather fleshy from the lateral plane of the postacetabular part of the ilium, and is inserted indirectly into the head of the tibia by being attached to the distal part of the m. ilio-tibialis. Nerve from the ischiadic plexus.

The *m. gluteus anterior* (m. gluteus quartus) is very small; its muscular part consists of only a few fibres. Its aponeurosis arises from the space left between the origin of the m. iliac. ext. post. and the antitrochanter. Its short but broad and flat tendon runs over the external trochanter, passes the tendons of the external iliac muscles, and is inserted just distad from their insertion into the outer aspect of the femur. The nerve to this muscle is given off from the pl. ischiadicus; it passes round behind the antitrochanter out of the ischiadic foramen.

The *m. ambiens* arises with a short and distinct tendon from the pubic spine; its roundish and somewhat ribbon-shaped belly tapers out into a long slender tendon, which, after partly piercing that of the m. femoro-tibialis, passes over the knee into its outer side and then supports one of the heads of the m. flexor perforatus digiti III. Between the proximal part of the ambiens muscle and the inner trochanter of the femur, that long nervous branch which is sent off from the posterior part of the crural plexus passes out, and then runs along the inner side of the thigh, superficially to the inner side of the proximal end of the leg (Rage's branch, as termed by me in my paper on the Ratitæ). The ambiens muscle, on account of its nervous supply, belongs to the crural plexus, as the nerve of this muscle is one branch of the large nervous stem which passes laterally from the m. ambiens into the inner head of the m. femoro-tibialis (m. rectus internus femoris).

The *m. femoro-tibialis* (mm. vasti or m. cruræus) consists of three heads. The inner one (m. rectus internus femoris) is the biggest and most distinct; it arises from the whole inner and hinder aspect of the femur, and is inserted, independently of the others, into the anterior crest of the tibia. The middle head is also very fleshy, arises from nearly the whole of the anterior aspect of the femur, takes up the distal part of the m. ilio-tibialis, and is inserted into the patella and into the head of the tibia. The third or outer head is quite separate from the others, and is inserted into the outer edge of the caput tibiæ by the help of the ligamentum tibio-patellare. All these three heads are supplied by nerves from the crural plexus.

Fig. 1.



Deeper adductor muscles of the right thigh of *Pterocles arenarius*

The *m. ilio-fibularis* (m. biceps) takes its origin from the lateral margin of the postacetabular ilium and from the lateral plane of the distal half of this bone. Its tendon passes through the tendinous loop near the poplitea, and is inserted into the neck of the fibula. Its nerves come from the ischiadic plexus.

M. caudæ ilio-flexorius (m. semitendinosus). See fig. 1. This ribbon-shaped muscle arises from the lateral processes of some of the first caudal vertebræ and from the outer plane of the spina ilio-caudalis. The so-called accessory part of this muscle is well developed; it descends from the outer and lower surface of about the distal third of the femur; and its fibres join those of the long or main part nearly at right angles. The line of junction is indicated by an oblique tendinous raphe. The two combined parts are inserted, first into the neck of the tibia by a strong tendon; secondly, a small tendon, looking like the continuation of the raphe, descends superficially to the back of the leg and joins the caput femorale internum m. gastrocnemii. Nerve-supply, together with the next muscle, from the ischiadic plexus.

The *m. ischio-flexorius* (m. semimembranosus) is feebly developed, and loses its independence by becoming blended with the m. caudæ ilio-flexorius, which completely covers it externally. It arises from a small part of the middle line of the lateral margin of the ischium.

The *m. caudæ ilio-femoralis* consists of two chief parts. The most lateral one, or long head (long head of femoro-caudalis), is a very narrow, slender, muscular ribbon, which arises from the proc. lat. of the last caudal vertebræ, and is inserted by a narrow thin tendon into the latero-posterior plane of the end of the proximal third of the femur. Towards its insertion the fleshy part of this long head is to a great extent blended with the more proximal or greater part: the latter (accessory femoro-caudal) arises from part of the membrane of the foramen oblongum, and from the outer plane of the hindmost or distal part of the ischium, whilst only a few fibres arise from the adjacent part of the ilium. The nerve which supplies these two muscles comes from the ischiadic plexus, and passes externally over the m. ischio-femoralis. I must mention here a peculiar little muscular slip which I have not often observed in birds. It arises (see fig. 1) as a small fleshy flat slip from the outer aspect of that region where the pubis and ischium approach each other; it is then partly covered by the long head; its thin tendon unites with that of the long head. It was present also on the other side, and was supplied by the same nerve-branch together with the two large heads. The presence of this little muscular slip is an instance of the great variation to which this group of the m. caudæ ilio-femoralis is subject.

The *m. ischio-femoralis* (m. obturator externus) arises with fleshy fibres from the dorsal, distal, and ventral margins of the foramen oblongum; its strong tendon is inserted into the outer plane of the femur, just distad from the insertion of the m. obturator. It receives its nerve from the ischadic plexus.

The *m. obturator* arises from that part of the inner plane of the ischium which bounds the foramen obturatum and also from the adjoining part of the pubis. It is inserted by means of a very strong tendon into the externo-posterior plane of the outer trochanter.

Another muscle, which we may call an accessory muscle to the m. obturator, is very small, and arises from the most proximal and lateral part of the ossa pubis et ischii near the acetabulum; its fleshy but short belly is separated from that of the m. ischio-femoralis by the tendon of the main obturator muscle. It is inserted just between the tendons of these two muscles. As this small muscle is not supplied by the pl. ischiadicus, but together with the m. obturator, we cannot consider it to be a representative of the gemelli muscles, nor of part of the m. obturator internus of mammals. But the m. obturator of birds, together with its accessory muscles, might correspond to the m. obturator externus of Mammalian anatomy.

The *m. pubi-ischio-femoralis* (m. adductor) consists of two layers, a lateral and more proximal and a median or distal one. The lateral part is ribbon-shaped, and arises from the latero-ventral margin of the middle third of the spines, opposite the pubis. It is covered laterally by the m. caud. ilio-femoralis, and is inserted into the hinder aspect of the distal half of the femur, lying mesiad from the femoral portion of the m. caudæ ilio-flexorius (femoral portion="accessory part"). The inner layer arises from the lateral margin of the distal two thirds of the ischium, but not from the os pubis or the ischio-pubic membrane. This flat muscle forms scarcely any tendon, and is inserted as a broad, but flat and vertical sheet into the distal half of the femur, including the internal condyle, and into the hinder surface of the head of the tibia.

The *m. popliteus* is developed as usual.

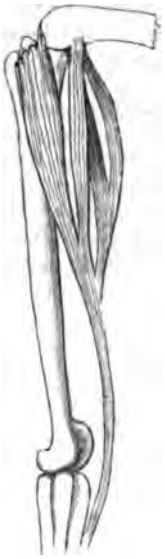
The *m. tibialis anticus* consists of two heads. The external or femoral is represented simply by a long tendon arising from the anterior inner margin of the internal condyle; its short belly soon fuses completely with the tibial or chief head, which latter takes its fleshy origin from the crest and head of the tibia. The strong tendon of this muscle passes under the transverse ligament of the leg, and is inserted into the anterior or dorsal sulcus of the tarso-metatarsal bone, not far from the joint. The whole muscle is covered superficially by the m. gastrocnemius (inner head) and by the m. peroneus superficialis. Nerve-supply, as in all the following muscles, from the ischiadic nerve.

M. peroneus superficialis.—The most superficial muscle on the anterior and outer side of the leg. It arises from the crest of the head and from the anterior plane of the neck of the tibia, and sometimes from the head of the fibula. Its broad tendon passes round the outer side of the leg to the hinder aspect of the intertarsal joint, and then divides into two tendons: one is very broad, and forms the deep sheet of the susceptaculum; the other one is much narrower, passes laterally over the external malleolus of the tibia, and then joins the tendon of the m. flexor perforatus dig. III.

A *m. peroneus profundus* was not present in my specimen of *Pterocles*. However, this muscle is subject to much variation. I found it well developed in *Euplocamus prælata*, but wanting in *Gallus* *bankiva* and in *Penelope superciliosa*, whilst in our common Domestic Fowl it is generally present. In the Pigeons it is often absent. If present, this muscle arises with a long but narrow and fleshy belly from the anterior plane of the angle between the lower end of the fibula and the middle third of the tibia; its strong tendon then passes laterally over the joint and is inserted into the proximal margin of the plantar tarso-metatarsal bone, near the external malleolus. When contracted, the muscle bends the tarso-metatarsus slightly dorsad and inwards.

M. gastrocnemius.—This large muscle consists in *Pterocles* of two parts, each of which arises with two distinct heads (fig. 2):—

Fig. 2.



Lateral posterior view of the gastrocnemius muscle of right side of *Pterocles arenarius.*

I. Median part.

- *a. Cap. tibiale*: from inner and anterior aspect of the head and neck of the tibia, blending with the tendons of the m. femoro-tibialis.
- *b. Cap. femorale*: from hinder aspect of the intercondyloid region, and at the same time from the ligam. femoro-tibiale internum.

II. Lateral part.

- *α*. With a slender but distinct tendon from the intercondyloid region and from the outer margin of the femur; its belly passes between the two principal branches of the ischiadic nerve, and is supported by the descending tendon of the m. semitendinosus = m. caudæ ilio-flexorius.

β. This head is the larger of the two, and is the most superficial one at the hinder and external aspect of the leg, as it arises from the external condyle of the femur. The "tendo communis" of these four heads is inserted into the hinder margin of the tarso-metatarsal bone, but principally into the tibial and median margin.

The *m. extensor digitorum communis* appears after the removal of the superficial peroneal and of the tibialis muscle, being completely covered by the latter. It arises from the anterior plane of the head and neck of the tibia; its tendon passes through the transverse ligament and the bony bridge just above the intertarsal joint; it then runs down on the anterior surface of the metatarsal bone, and sends a tendon to the dorsal part of the bases of the phalanges of the three front toes. The mode of splitting up of the common tendon into the special tendons and of their insertion varies much.

M. perforatus digiti II.—This muscle appears after the removal of the most superficial of the flexor muscles on the outer side of the leg. It comes with fleshy fibres from the ligam. fem. tibiale externum and from the hinder part of the neck of the tibia. Its long and slender tendon, after crossing the legs, passes right through the susceptaculum in the middle of the hinder aspect of the intertarsal joint, where it lies deeper than all the other tendons. It is inserted into the ventral side of the phalanges II. et III. digiti II.

M. perforatus digiti III. consists of two very fleshy heads. The *outer* one is completely fused with that of the m. perforatus dig. II.; it arises partly from the external condyle of the femur and from the tendinous loop; one part of this head forms the continuation of the tendon of the ambiens muscle. The *inner* head arises with a distinct tendon from the hinder aspect of the middle part of the intercondyloid region.

The combined tendon of the whole muscle, when passing over the intertarsal joint, is quite flat, and lies between the susceptaculum and the broad tendon of the gastrocnemius muscle. Thus in this region it is the most superficial of all the flexor tendons. At the middle of the metatarsal bone the tendon gives off a slip to that of the m. perforans et perforatus dig. III.

M. flex. perforatus dig. IV.—Its thick belly arises from the hinder aspect of the external condyle of the femur and from the intercondyloid region. Its tendon, simply covered by the tendo Achillis, passes as the most superficial one over the joint and is inserted into the basis phal. II. dig. IV.

The *m. flex. perforans et perforatus dig.* III. arises with a long slender head together with the m. perforatus dig. III. and with the m. perforatus dig. II.; its tendon sends a slip to that of the m. perforatus, which it also perforates, and is inserted into the bas. phal. II. et III. dig. III.; on the other hand, this tendon is pierced by that of the m. flexor profundus.

M. flex. perforans et perforatus dig. II.—The strong and fleshy belly of this muscle arises with a short tendon from the hinder plane of the intercondyloid region; it passes through a special canal in the susceptaculum, and is one of the deepest muscles. It is inserted into the cap. phal. I. dig. II.

The *m. flex. profundus s. communis digitorum* consists of two principal heads. The *outer* one arises with fleshy fibres from the fibula and is partly fused with the m. tibialis; its strong tendon passes the intertarsal joint superficially to the susceptaculum, and is only covered by the tendo Achillis; it passes the pulley on its outer or lateral, not on its ventral or posterior margin. The *inner* or chief head takes its origin from the hinder plane of the greater part of the tibia; its tendon runs as the deepest of all through the pulley, and then unites with that of the outer head; the tendon then divides into three, each of which is inserted into the basis of the last or distal phalanx of the II., III., or IV. digit.

Although *Pterocles* possesses a rudimentary hallux, which consists of two very small bones not articulated with the metatarsus, there was no trace of a *m. flexor hallucis longus* to be found. But there was a *m. flexor hallucis brevis*, which arose from the hinder aspect of rather more than the upper two thirds of the tarso-metatarsal bone, and was inserted into the cap. phal. I. dig. I.

An *abductor brevis. dig.* IV. and an *abductor brevis dig.* II. were likewise present—the former pulling the fourth toe inwards, *i. e.* towards, the latter drawing the second the away from the middle one. Both consequently move these two toes tibiad, and are morphologically abductors.

For the *m. flexor brevis dig.* III. see note, § 4.

Note.—Mr. Forbes has kindly drawn my attention to Mr. A. Haswell's paper " Notes on the Anatomy of Birds. III. The myological characters of the Columbidæ," in Proc. Linn. Soc. New South Wales, 1880, p. 306; and has expressed grave doubts about the correctness of some of the statements made in it. Mr. Haswell, at the end of his paper, mentions five points "which seem to be especially characteristic of the family." But I find that of the five points, one is totally incorrect, and three others, viz. nos. 3, 4, 5, are not characteristic of the Columbidæ. These points are:—

1. The absence of a posterior belly of the m. latissimus dorsi. Mr. Forbes and I, on examining the following birds, which were at hand—*Carpophaga*, *Chalcophaps*, and *Columba*—found this muscle consisting of two bellies, the posterior one being just as well developed in these Pigeons as in *Astur*, arising from the anterior margin of the ilium and from the last dorsal vertebræ, and inserted by means of a tendon below that of the anterior belly into the humerus. Throughout their whole length the two bellies were connected by a fascia.

3. The absence of the m. glut. externus and the presence of the adductores brevis et longus, the semitendinosus and semimembranosus. Now the m. gluteus externus (*=glut. anterior*) is generally very small, but plainly visible in many birds, such as Pigeons, Passerine birds, &c., and not absent as stated by Mr. Haswell.

The four other muscles are well developed in most birds, as Prof. Garrod has stated over and over again, and as the dissection of any fowl will show.

4. "The special relation of the tendon of the ambiens (when present) to the fibular head of the flexor perforatus secundus tertii digiti." The distal end of the ambiens muscle, when typically developed, always forms the continuation of one of the heads of the m. flexor perforatus dig. II. et III.

5. "The presence of lumbricales in the foot." The muscle which Mr. Haswell takes to be the representative of the lumbricales muscles of mammals has not "hitherto escaped the notice of anatomists," and it is not "peculiar to the Pigeons," since it is also present in many other birds, *e. g.* the Ratitæ, and has been described by Meckel, although he gave no name to it, in his 'System der vergleich. Anat.' iii. p. 388, and in his 'Archiv für Anat. u. Physiol.' pp. 278 & 279.

With regard to the muscles of the leg, I am unable to point out any typical differences between Sand-Grouse, Fowls, and Pigeons. The absence of the m. flexor hallucis longus in *Pterocles* is of no importance, as this muscle is generally absent in birds which have no hallux or only a small one, and, moreover, as the absence of this toe itself affords no family character. Of course there are many points, *e. g.* the mode of origin and the arrangement of the tendons of the muscles, and even the absence of the m. plantaris and of the m. peroneus profundus, which are noteworthy in *Pterocles*; but all these things are variable, and give us no characters which hold good throughout the Gallinaceous or the Columbine group.

It is the same with the m. ambiens: this muscle is present and well developed in *Pterocles* and most probably in all the Rasores; in the Pigeons its presence is variable.

Of all the other muscles connected with the leg, there is none that shows any practical difference between Sand-Grouse, Pigeons, and Fowls, and even (if we include them in our comparison) the Plovers.

On the whole, however, the myology of *Pterocles* indicates that it is more nearly allied to the Pigeons than to any other group of birds.

VISCERA.

"The trachea is cartilaginous: and it has at its bifurcation what the Grouse is bereft of, viz. a pair of laryngeal muscles, as in the Pigeons, *Talegalla*, and Plover" (*Parker*).

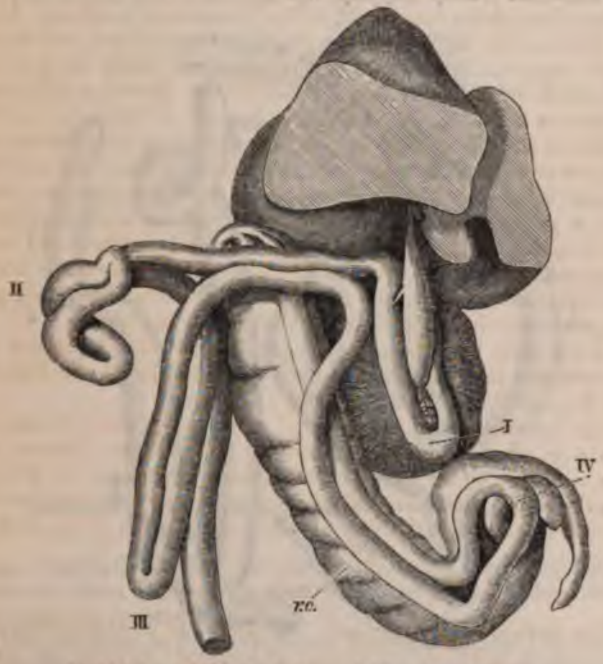
The *crop* (*ingluvies*) of *Pterocles* is a simple dilatation of the anterior and lateral walls of the œsophagus, without any constriction in the middle line, although it is broader than long. Its walls are very thin on its anterior parts, and show longitudinal folds and glands; the dorsal part, the prolongation of the dorsal half of the œsophagus, is thicker and slightly muscular, the external sheath consisting of transverse, the inner one of longitudinal smooth muscular fibres.

In the Pigeons the crop is different. It consists of two lateral and symmetrical dilatations of the lateral walls, whilst the middle part is simply the continuation of the œsophagus, slightly widened out at the upper and lower end of the crop. The glands are nearly equally distributed over the inner lining of its walls, and are arranged in very irregular longitudinal folds.

The *proventriculus* of *Pterocles* is a long oval, and comparatively small; its walls are thick and full of glands, which are "ovoidal and simple as in the Pigeon and Plover, not botryoidal as in the Grouse and Fowls."

The *ventriculus* or *gizzard* is of a subquadrangular shape, much flattened and very muscular, showing on the right and on the left side a speculum tendinosum; the posterior wall is deeply bent in towards the middle line. Its inner lining consists of a hardened and much thickened excreted mass, without however forming any distinct triturating planes.

Fig. 3.

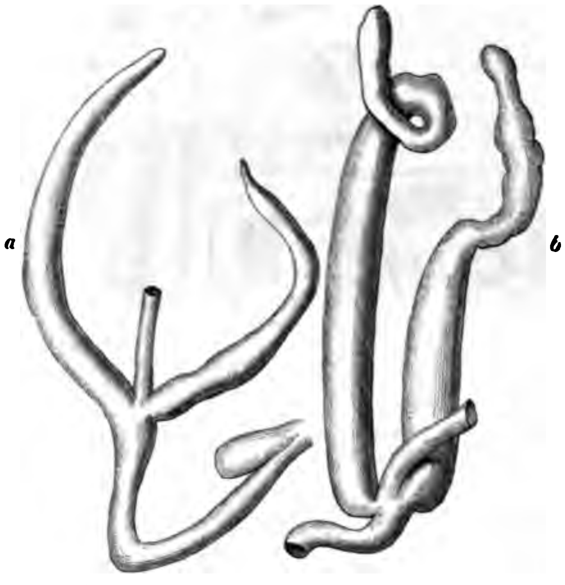


Right lateral view of intestines of *Pterocles arenarius*.
rc, right cæcum; I, II, III, IV, intestinal loops.

The *duodenum, ileum,* and *rectum* form four distinct "closed" loops, which are arranged as follows:—The first, or duodenal loop is very short and straight, as it only extends over the posterior margin of the gizzard; its diameter is slightly larger than that of the ileum; the length of the duodenal loop in *Pterocles* is about 4·5 centim. The second loop is nearly double the length of the first, and has its apex doubled up into an irregular knot, as is characteristic of the Gallinacei proper. The third loop is of about the same length but straighter. The fourth loop is almost three times as long as the duodenal one; it is stowed away in the most ventral and lowest part of the abdominal cavity, between the gizzard and the vent; throughout its whole length it is accompanied by the two cæca, which are closely attached to this loop, as they are supplied by the same branch of the mesenteric artery. The rectal part of the intestinal tract is slightly wider than the ileum and the duodenum.

The *cæca* (see fig. 4) are extremely well developed in *Pterocles*, being 16 centim. long, and are inserted at a distance of 15 centim. from the anus. They are very wide and have very thin walls; their inner lining forms about 6 longitudinal slightly elevated folds. (Prof. Parker says that the cæca of the Sand-Grouse have 12 longitudinal folds, not 7 as have the Ptarmigans.)

Fig. 4.



a, Cæca of *Pterocles arenarius*; *b*, Cæca of *Syrrhaptes paradoxus* (after Brandt).

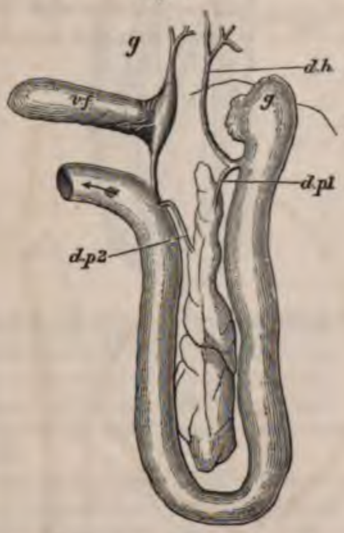
The cæca of *Syrrhaptes*, according to Brandt, are very wide and long too, but differ from these organs of *Pterocles* in the shape of their terminal parts, as shown in fig. 4.

The *liver* of *Pterocles* I found to consist of two principal lobes—the right lobe being about three times larger than the left one, which exhibits on its inner side a small Spigelian lobe. The sharp lower edges of both lobes have several slight emarginations; and there is a strong commissure between the lobes.

The *gall-bladder* in my specimen of *Pterocles* is large, forming a very distinct cylindrical lateral pouch; its cystic duct opened into the ascending end of the duodenal loop, whilst the hepatic duct was inserted opposite to the cystic duct, just below the pylorus.

This arrangement of the ducts, however, seems to be subject to much variation; for Prof. Brandt found that the cystic duct in *Syrrhaptes* either opened into the terminal part of the duodenal loop, together with the hepatic duct, or in other cases near the pylorus, when the hepatic duct was inserted into the duodenum opposite the pylorus. (See figs. 5, 6, 7.)

Fig. 5.



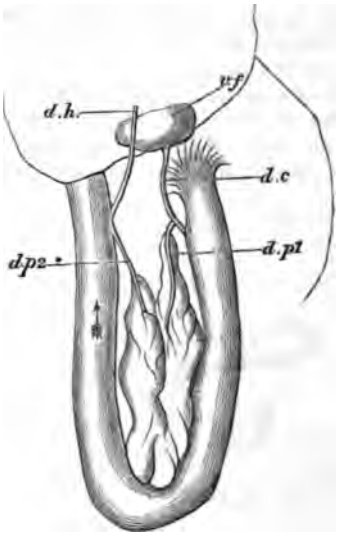
Duodenum of *Pterocles arenarius*, with the bile- and pancreatic ducts.

The *pancreas* in *Pterocles* and in *Syrrhaptes* opened by two ducts, one into that bile-duct which was inserted near the pylorus, the second just in front of the other bile-duct.

The arrangement therefore was as follows:—

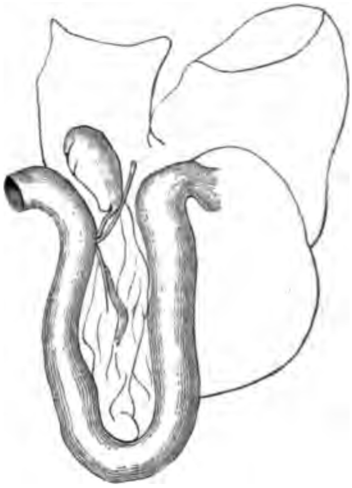
Pterocles arenarius: d. hepatic + 1st d. pancreat. inserted near the pylorus.
2nd d. pancreat. + d. cystic (see fig. 5) inserted opposite the pylorus.
I. *Syrrhaptes paradoxus*: 1st d. pancreat. + d. cyst. inserted near the pylorus (fig. 6).
2nd d. pancreat. + d. hepat. inserted opposite the pylorus.

Fig. 6.



Duodenum of *Syrrhaptes paradoxus*, with bile- and pancreatic ducts (after Brandt).

Fig. 7.



Duodenum of *Syrrhaptes paradoxus*, with bile- and pancreatic ducts (after Brandt).

II. *Syrrhaptes paradoxus*: 1st d. pancreat. inserted near the pylorus (fig. 7).
2nd d. pancreat., + d. hepat. + d. cystic. inserted opposite the pylorus.

	Total length of gut.	Relative length.[1]	Length of cæcum.	Distance of cæca from anus.
	centim.		centim.	centim.
Pterocles arenarius	83	7–8	16	15
——— ——(after Brandt)	80		15·5 & 18·5	12
Syrrhaptes (after Brandt)	87	...	...	13
Perdicula cambayensis ...	38–42	6–7	5	3–4
Perdix cinerea	75	8	17	6
Phasianus pictus	106	7·5	10–15	8–12
—— swinhoei	106	7	13	7
Euplocamus prælata......	122–152	7–7·5	22 & 23	8–12
Orax alberti	222	9	10 & 14	15
Columba livia	96–125	12–13	0·5–0·8	4–5
Oalœnas nicobarica	125	10–11	0	
Peristera geoffroii	34	4	0·3	4
Erythrœnas pulcherrima	41	5·5	0	

The liver of the Rasores, as well as that of the Columbæ, is quite different. The left lobe is divided again into two by a deep fissure, so that the whole organ might be called trilobed. The right lobe is generally the larger; a Spigelian lobe is present in most of these birds. The outline of the lower margin varies much in the different Fowls and Pigeons.

The existence of a *gall-bladder* in the Pterocletes might be looked upon as a strong indication of difference between them and the Pigeons, as in the Gallinaceous birds this organ as a rule is well developed. However, it must not be forgotten that in several typical Rasores, as in *Euplocamus*, *Numida*, and *Penelope*, there is sometimes scarcely any pouch-like dilatation of the bile-ducts. In the Rasores the cæca are, without any exception, very well developed, and have mostly an extremely large and wide lumen. The length of both the cæca compared with the length of the intestinal tract (from pylorus to anus) is in the proportion of 1 : 7 (*Crax*), or even 1 : 2·2 (*Perdix*). In the Pigeons, on the other hand, the cæca are always in a rudimentary condition, their sum total being in the proportion of 1 : 75 in our domestic Pigeon, and 1 : ∞ in *Goura*, *Calœnas*, *Chalcophaps* &c., as they are either completely wanting in most of the Columbæ, or are only represented by very small, often barely visible, vermiform-like appendages.

It has sometimes been stated that Pigeons have to rank with such birds as do possess cæca, because such organs, although very small, exist in our common Pigeon, and thus they are in contrast with those birds in which cæca are altogether wanting, like Woodpeckers, Parrots, and others. Garrod likewise included the Passerine birds amongst the Menotyphla (to use a Hæckelian term for animals possessing cæca). Now I think this is not correct; and we must consider this matter a little further. Garrod himself came to the conclusion that the ancestral bird-stock did possess cæca; as this is undoubtedly true, it follows that all those birds which are now found without cæca must have lost them, either phylogenetically or even during their ontogenetic development. In fact we see, in embryos of such birds as have when adult only very small quite rudimentary cæca, that these organs are, in the embryo, just as well developed as in birds with long cæca; but these cæca, in a Pigeon for instance, do not grow any further. They are in early life stopped in their development, and thus remain in a rudimentary state. Again, in all those birds which are completely devoid of cæca the tendency to suppress these organs is simply carried out to the extreme. We cannot, therefore, group the birds into birds with cæca and birds without cæca; and this is especially wrong, as there exist many birds which, although apparently allied to each other, differ greatly in the presence or absence of cæca.

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[1] See my paper in the 'Jenaische Zeitschrift für Naturwissenschaft,' 1879, p. 369.

If we want to take the cæca into consideration at all, we must take another point of view: that is, are the cæca of any use to the birds in question or are they not? Now, apparently, in all birds which have well-developed cæca they are useful, although we must confess that we do not know in what way. Again, in birds with very small cæca, where these organs are simply vermiform-like processes, and which never contain any chyle in their extremely small lumen, they cannot have any physiological function, else they would not have been suppressed.

No doubt in some cases, in which they are not quite aborted, as for instance in the Crows and in our common Pigeon, the glands in their walls may still produce some secretion, which then may be made the best of. But this is one of the cases in which rudimentary organs are not completely stopped in their functions although they are useless, simply because the animal hitherto has not been able to get rid of them entirely: thus, for instance, the appendix vermiformis of man, or another example still more striking, our thymus gland, which, although a gland, is now without a duct, and thus rather a paradox.

But to return to our question. It is clear that birds with rudimentary cæca have to be grouped together with lipotyphlous birds, *i. e.* birds which have lost these organs.

The great development of the cæca therefore constitutes a considerable difference between the Pteroclidæ and the Columbidæ, as the former and the Gallinacei are decidedly menotyphlous and the Columbæ lipotyphlous.

In the Gallinacei the whole digestive tract always forms four very distinct loops: the duodenal one is the first; the next two loops are formed by the ileum; in birds which, like *Perdix*, have a comparatively short gut, these two loops are very short, and are stowed away on the right side of the abdominal cavity; when the ileum is relatively long, the number of the loops is not increased nor do the two loops grow in a straight direction, but the apex of each turns backwards so as to give the loops a horseshoe shape. The fourth loop is formed by the last third of the ileum, and is accompanied by the cæca; the whole loop is never a "closed" one, its terminal branch is nearly straight, the other one much shorter and, if the gut be long, irregularly curled.

We meet with a totally different arrangement in the Columbæ. There are invariably only three loops formed by the intestinal tract. The first, the duodenum, is very wide, and sacculated at the apex. The second is very long, and, in all those species where the total length of the intestine is not (as for instance in the fruit-eating *Carpophaga latrans*) extremely short, is entirely coiled up into a left-handed spiral. As a rule there are in this spiral 3 direct and 2 retrograde turns; the number of these, however, wholly depends on the relative length of the ileum: thus in the common Pigeon, with the relative length of the gut about 12, the apex of the ileum-loop has turned round 3½ times; whilst in others, like *Chalcophaps*, the number is less; and, lastly, in Pigeons with very short guts, as in *Carpophaga*, a spiral is not developed at all (because, as far as we know at present, the intestinal spiral in certain birds is only one of the means of stowing away the longitudinally growing gut). But it must not be forgotten that in *Columba* as well as in *Carpophaga*, whether the ileum be long or short, we never have more or less than three folds. The last, or third loop is a very long one too, entirely closed or double throughout its whole length.

MODE OF LIFE AND PROPAGATION.

The Sand-Grouse differ greatly from the Pigeons in their mode of *drinking*. It is well known that the latter, during the act of drinking, dip their bill into the water as far as the cleft of the mouth, and then suck the water in without raising their head till they have finished drinking. *Pterocles* and *Syrrhaptes*, on the other hand, drink as Fowls and other birds do, by taking up water mouthful by mouthful and letting it run down the throat. This peculiarity is probably the result of a special mechanism of the muscles of the throat and glottis, but is as yet unexplained.

Their flight consists of rapid uniform movements of the wings, and generally resembles that of the Pigeons more than that of the Plovers; but they do not glide or soar as the Pigeons do.

From their voice we cannot gather much information as to their affinities; but certainly they do not coo.

During the greater part of the year they are gregarious. They are monogamous like Pigeons and Plovers, differing in this respect greatly from the Rasores, which are typically polygamous. Their nest is extremely simple and situated on the ground. The number of eggs laid by *Pterocles* is three; while according to Radde *Syr-*

rhaptes lays four, which in general appearance and so-called structure resemble those of certain Partridges.

The Plovers lay the same number. The Pigeons, on the other hand, invariably lay only two; and this is so characteristic of the whole group that Bonaparte named them Bipositores. Again, all the true Gallinaceous birds produce a great and indefinite number of eggs. Therefore in this respect the Sand-Grouse are more nearly allied to the Plovers than either to Grouse or Pigeons.

According to an observation made in the Zoological Gardens of London in August 1865, the period of hatching seems to be a little more than three weeks: two eggs were laid at the beginning of August; and the young birds came out on the 29th of the same month.

But one of the most valuable points, as regards the systematic position of the Pterocletes, is the fact that the young when hatched are thickly covered with hairy down, and that as soon as their plumage has dried they are able to leave the nest and seek their food. This removes them far from the Pigeons, which are the most decided pædotrophic or gymnogenous of all the birds we know.

Now to sum up. We have seen that there are many points in which the Pteroclidæ have striking resemblances to the Columbidæ; but there are also many points in which they approach the Rasores; and it is difficult, if not impossible, to made out which characters are the more important.

Prof. Parker was the first to point out clearly that there is a relationship between Sand-Grouse and Plovers; and Prof. Garrod, in his classification of birds, groups the Columbæ, including Pteroclidæ, and the Limicolæ, including Charadriidæ, together under his order Charadriiformes. But the Columbidæ undoubtedly are related to the Rasores through such forms as the Cracidæ (*Peristeropodes*, Huxley) and the Tetraonidæ; and, in addition, they are linked together by *Pterocles* and *Syrrhaptes*. These circumstances show that there exists a close relationship between Rasores, Columbæ, Pterocletes, and Limicolæ. Phylogenetic tables as a rule are faulty from being highly hypothetical, and from the imagination being frequently drawn upon in their compilation. However, they can be useful, even if they only show where our knowledge is yet insufficient, or why systems hitherto made do not agree with more recent ideas. Therefore I venture to draw the outlines of a branch of the avian stock, not led by preconceived ideas, but solely guided by the consideration of facts we know, or at least we have a certain right to believe we know.

1. Rasores, Columbæ, and Limicolæ are nearer related to one another than to the rest of the birds.

2. If the Columbæ approach nearer to the Charadrii than to the Rasores, we can express this idea by a stock which gives off two main branches:—one for the Rasores; and another one which again soon divides into two—one Columbine, and one for the Plovers (see fig. 8).

3. As the Pigeons have closer affinities to the Fowls than the latter have to the Plovers, the Pigeons must be represented by the middle branch, that to the extreme left remaining for the Plovers.

4. The most specialized of the Rasores (that is to say, the typical Alectoromorphæ) we have to put at the end of the right branch. The Tetraonidæ and the Cracidæ are those which, of all the Rasores, show the greatest resemblance to other families; they must therefore form the earliest or lowest twigs of the Rasorial branch; consequently we have to put their special roots nearest to the biggest and at the same time more indifferent stock.

But now as to *Pterocles*.

1. No doubt the Sand-Grouse are more nearly allied to the Rasores than the Pigeons are. Consequently we must seek for their root between the Rasorial and the Columbine branch.

2. Again, the Sand-Grouse are more nearly allied to the Pigeons than to the Plovers; thus their branch must be put nearer to the Columbine branch than to that of the Plovers.

Fig. 8.

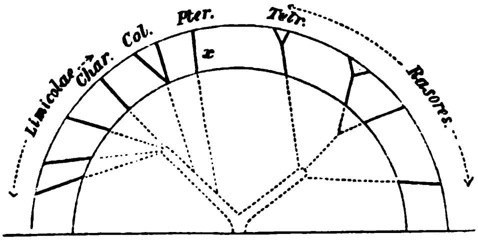

Diagram showing the supposed relationship of the Pteroclidæ.

This conclusion and the former can be reconciled only if we put the Sand-Grouse branch at x; and as this places them pretty nearly in the centre of our hypothetical table, it proves that our final conclusion cannot be far from right.

The fact is that birds just a little less specialized than *Pterocles*—in other words the direct ancestors of *Pterocles*—would contain all that is necessary to develop them into either Fowls, Pigeons, or Plovers.

Considering these circumstances, we see once more that, as Macgillivray and Professors Sundevall and Garrod have maintained, the Pigeons are not so closely related to the Fowls as is generally supposed.

It would be extremely difficult to arrange the birds represented in our table into families and groups as is required in a practical system. If we want to divide them into only three groups—Plovers, Pigeons, and Fowls—of course *Pterocles* has to go with the Pigeons; but this would not express its close relationship to the Tetraonidæ. Again, we cannot include the Pigeons and Fowls under one large group, and the Plovers under a second, because the Pigeons must be placed along with the latter. And Pigeons and Plovers cannot form one large group and the Fowls the other, because then this Plover-Pigeon group would include a form, viz. *Pterocles*, which we know to be more closely allied to the Rasores than to *Charadrius*. It must also be remembered that Snipes and Gulls are closely related to the Plovers; and of course *Pterocles* cannot be placed in such a position as would indicate that it is more closely related to the Gulls than to the Grouse. Thus it will be best to make a group or family Pterocletes, as Mr. Sclater has done, coordinate with those of Pigeons, Plovers, Gull, Fowls, and the like.

On the other hand, if we are to answer the straightforward question Is *Pterocles* more nearly allied through its ancestors to the Pigeons or to the Fowls? we are compelled to say that they are nearest to the Pigeons. Of course they have many features in common with the Fowls; but in no case we can include them under the latter, for the following reasons:—

Pterocles shows some, although only a few, anatomical points which we only find amongst the Columbidæ, whilst all the other numerous points in which it resembles the Fowls are such as must have been common to the old ancestral Stork, as we find them again in some of the Limicolæ. But some of its Columbine features it is impossible to trace so far back, as they indicate a very high degree of specialization. *Pterocles* must have branched off from those birds which we may term "incipient Pigeons," and then, for reasons we can only suggest (perhaps similar conditions of life, and the like), have preserved and developed many of those old characters which the Fowls have also inherited from the same source, and have them developed in a similar way, as living under the same conditions.

The main part of the ancestral or incipient Pigeons at the same time started in another direction, losing, as they proceeded, many of the old characters[1], and acquiring numerous new ones, till they became that highly specialized group which is now called Columbæ.

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[1] Among the most important characters common to the ancestral stock which the Pigeons have lost, or are in process of losing, are the following:—

1. The Pigeons have nearly completely lost the cæcal appendages of the rectum.
2. There seems to be a tendency to lose the ambiens muscle, as in many of the Pigeons it is completely absent, and in others this muscle is unstable in its presence.
3. They have lost the aftershaft to the feathers.
4. They have almost completely lost their nestling plumage, and the old character of being autophagous birds, as their young are now hatched nearly nude, blind, utterly helpless, and depending entirely on their parents, and have to spend a considerable part of their childhood in a very imperfect state.

2. Note on a Peculiarity in the Trachea of the Twelve-wired Bird-of-Paradise (*Seleucides nigra*). By W. A. FORBES, B.A., Prosector to the Society.

[Received March 7, 1882.]

The death (from congestion of the lungs, with resulting hæmorrhage, and thickening of the walls of the intrathoracic air-cells) on Feb. 22nd last of the male *Seleucides nigra*, purchased by the Society on March 19, 1881[1], has given me the opportunity of observing a peculiarity in the construction of its trachea of a nature unlike any thing of the kind yet known to me. The windpipe, for the greater part of its course, has the normal avian structure, the tracheal rings, which are ossified and, as usual, notched both before and behind, being of the ordinary form, and separated by but narrow intervals from each other. For a space, however, of about 1 inch above the largely developed short pair of intrinsic muscles, the interval comprising 8 tracheal rings, it becomes peculiarly modified, the tube itself becoming slightly dilated and flattened antero-posteriorly, whilst the tracheal rings become broader, and ossified along the middle of their depth, the borders only remaining cartilaginous. This ossified part of each ring is slightly concave, so that when seen laterally the cartilaginous margins project slightly from it, the whole ring being thus like a fluted table-napkin ring, when seen in section. The intervals between these peculiar rings are very much deeper than those above, and occupied by delicate membrane only, so that all this part of the trachea is highly elastic.

The *sterno-tracheales* are inserted just below the lowest of these peculiar rings, which is the last but three of those composing the trachea—the next two, which are very narrow, and the last, which is broad and bears the pessulus, being concealed from view by the largely developed syringeal muscles, of which there are four pairs, all, except the small anterior long muscle, being inserted on the ends of the very strong third bronchial semirings. The lateral tracheal muscles are weak, extending, however, nearly to the thoracic end of the tube.

Nothing like the modification of the trachea here described obtains in any other allied form of Paradise-bird that I have been able to examine (including *Paradiseæ papuana* and *rubra*, *Ptilorhis alberti*, *Phonygama gouldi*, *Manucodia atra*, *Ptilorhynchus violaceus* and *smithi*); nor do I know any structure in other birds quite comparable with that now described, which is probably correlated with the very loud harsh note of these birds[2].

In all other respects *Seleucides* is, as might have been expected, a typical oscine Passerine.

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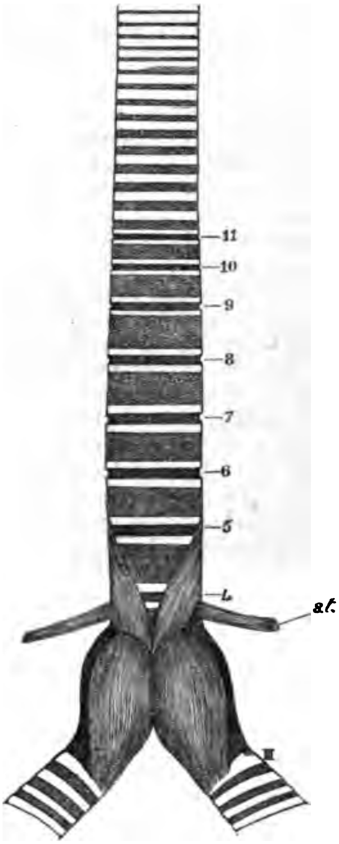
[1] See P. Z. S. 1881, p. 450.

[2] Mr. Wallace, speaking of this species, says (Malay Archipelago, ii. p. 254, London, 1869):—"It has a loud shrill cry, to be heard a long way, consisting of cáh, cáh, repeated five or six times in a descending scale; and at the last note it generally flies away."

I may take this opportunity of remarking that the various published figures of *Seleucides nigra* do not give a very accurate idea of the bird, as they fail to represent the peculiar way in which the leg-feathering ceases altogether some way above the "knee," leaving the large and muscular legs bare for about an inch or so above that joint.



Lower portion of trachea of *Seleucides nigra* ♂, from before. Twice the natural size.

4, 5, 6, 7, 8, 9, 10, 11. Fourth, fifth, &c. (from bottom) tracheal rings, peculiarly modified. III. Third bronchial semiring. *s.t*, *sterno-trachealis* muscle, cut short.

The eyes are brilliant red; the legs, including the bare skin above the "knees," pale red, the claws greyish. The mucous membrane of the mouth and superior surface of the tongue is bright emeraldgreen, a narrow line of this appearing at the angle of the mouth when the jaws are closed. When the beak is open, the beautiful green of the mouth and tongue is very conspicuous, and, contrasting with the bright red eye and dark velvety plumage of the head, adds greatly to the general appearance of the bird.

It would be interesting to know whether the females of *Seleucides* also have their mouth thus coloured, or whether it is a peculiarity of the male, developed as a sexual ornament[1].

3. A Note on *Strix oustaleti*, Hartlaub. By R. Bowdler Sharpe, F.L.S., F.Z.S., &c., Department of Zoology, British Museum.

[Received March 9, 1882.]

In the 'Proceedings' of this Society for 1879, Dr. Hartlaub described a Barn-Owl from the island of Vitu-Levu, which he called *Strix oustaleti*. I have recently had a pair of Owls submitted to me by Professor J. F. Blake of the University College, Nottingham—to the Museum of which they had been presented by Mr. Fillingham Parr, who procured them in the Fiji Islands.

I recognized, as I thought, *Strix oustaleti*; and on comparing the birds with Dr. Hartlaub's description I found there could be no doubt on the subject; but I could see at the same time that the bird was no true Barn-Owl, but a Grass-Owl, in fact our old friend *Strix candida*, probably occurring in Fiji on one of its migrations, which have proved so disastrous to the simplicity of its nomenclature.

As long as this Owl remained in India its synonymy consisted simply of two names—the original one of *candida* of Tickell, and *longimembris* of Jerdon; but on a Philippine specimen being discovered, it was named *S. amauronota* by Dr. Cabanis; and in the same year (1866) Mr. Swinhoe found it in Formosa and called it *S. pithecops*. Shortly after, it turned up in Queensland, only to be named *Strix walleri* by Mr. Diggles; and now its last appearance, in the Fiji islands, has gained it the additional cognomen of *S. oustaleti*.

Dr. Hartlaub cannot, I think, have got in the Bremen Museum a specimen of a Grass-Owl, or he could not have failed to see that *S. oustaleti* belonged to the *Strix candida* section; for of course, if compared with *Strix delicatula* and *S. personata* &c., the Fiji Grass-Owl comes out distinct enough. I do not think, from the absence of reference on Dr. Hartlaub's part to my 'Catalogue,' that he has done me the honour of consulting my work, published four years before his paper. On looking at the 'Key to the Species' of the genus *Strix* as given by me (Cat. B. Brit. Mus. ii. p. 290), I had not any difficulty in recognizing *Strix oustaleti* under the name of *Strix candida*.

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[1] P.S. (April 7).—A young male Rifle-bird (*Ptilorhis paradisea*) now living in the Society's Gardens has, it is interesting to observe, its mouth and tongue similarly brightly coloured, though of a lemon-yellow colour instead of green.

I may take this opportunity of remarking that the
lished figures of *Seleucides nigra* do not give a very
the bird, as they fail to represent the peculiar way
feathering ceases altogether some way above th ... South Africa.

.EY.

...he Boers, Major E. A. Butler,
...n Savile Reid were quartered for
...e, Natal. Here they not only made
... of birds, but took a large amount of
... species, which they intend shortly to
... have permitted me to describe here the
...me.

... name *Anthus butleri* (a very interesting
... and *Sphenœacus natalensis*, the Natal repre-
...nus, to which I will add the characters of *S.*
...rmediate form from Kaffraria.

...TLERI, sp. nov. (Plate XVIII.)

... with *Macronyx croceus*, the upper parts and the
... above and beneath are similarly coloured; but the crown
... tinted with yellow, and the under wing-coverts are of a
... paler sulphur-yellow; a white patch just in front of the eye;
... the head and neck brown, with a few dark-centred feathers
... the throat; chin, throat, and upper half of the breast yel-
... remainder of the underparts tawny buff with a slight yellow
... down the centre of the abdomen; the feathers of the crop and
... of the chest are mostly with black central streaks, and are very
slightly tinted with brown: flanks inclining to rufous-brown; sides
of the belly rather indistinctly striped with rufous-brown: under
tail-coverts with dark brown centres; under surface of the tail
brown, with white on the outer two pairs of feathers: the outer
pair white, margined on their inner webs with a brown patch of the
same form as the feather itself. Iris dark brown; upper mandible
horny brown, lower one lavender-colour; legs pale brown. Total
length 7·2 inches, culmen 0·5, wing 3·25, tail 3, tarsus 1, middle toe
without claw 0·7. November 9, Newcastle.

Four other specimens (one collected 6th June, and two males and a female, July) are apparently in the winter plumage, and differ from the one above-described in having no shade of yellow on the head, in the under surface of the body being tawny buff, only very slightly tinted with yellow on the middle of the breast and fading into white on the centre of the throat and chin. The yellow on the wings is about the same in them all; and this, together with the peculiar *Macronyx*-like dark mottling on the back, are characters by which the species may be readily recognized. In the specimen collected in

May the colouring is of a slightly more tawny hue than in the others.

SPHENŒACUS NATALENSIS, sp. nov.

Very similar to *S. africanus*, but differs in the almost uniform rufous-buff colouring of the under surface of the body, and in the absence of black shaft-stripes to the upper and under tail-coverts; the sides of the upper chest and crop, in some specimens, are slightly mottled with the dark tips and central stripes to the feathers, but show no distinct black marks; the flanks are generally entirely uniform, but in one specimen I find a few obscure dark central stripes to some of these feathers; the upper and under tail-coverts are always uniform.

The characters here given for this species are further borne out by the specimens in the British Museum. Although I separate the Natal form under the title of *S. natalensis*, I myself would regard it as merely a well marked local race of *S. africanus*.

The only specimen I have examined from Kaffraria is in some respects intermediate, but appears to me to be closer to *S. africanus*, in that the black markings on the sides of the body are very distinct, though fewer in number and smaller than in the Cape-Colony form. But the upper and under tail-coverts are without dark central stripes; so perhaps it would be more consistent to separate this form as a third race under the title of *S. intermedius*.

The distinguishing characters for these three races or species may be clearly summed up in the following key:—

a. With very distinct black central marks to some of the feathers on the sides of the body.
  a'. Upper and under tail-coverts with dark central stripes ... *S. africanus*.
  b'. Upper and under tail-coverts uniform, with no dark central stripes to the feathers .... *S. intermedius*.
b. With no distinct black marks on the sides of the body. Upper and under tail-coverts uniform, with no dark central stripes to the feathers. .... *S. natalensis*.

I have carefully examined the following specimens of these three birds, and find no character in the measurements.

S. africanus:—*a*, ♂, Cape (*Verreaux*); *b*, *c*, *d*, Cape (*Butler*); *e*, ♀, Paal, Cape Colony (*Shelley*); *f*, George (*Atmore*).

S. intermedius:—*g*, Kaffraria (*Barratt*).

S. natalensis:—*h*, ♂, Pinetown (*T. L. Ayres*); *i*, *j*, *k*, *l*, Transvaal (*W. Lucas*); *m*, Swaziland (*T. E. Buckley*): Shelley Mus. *a*, ♂, *b*, ♂, *c*, ♂, *d*, ♂, Newcastle: Butler Mus. *a*, ♂, *b*, ♀, *c*, ♂, Ingagane river; *d*, ♀, Drakensberg: Reid Mus.

5. On a new Species of *Agrias* from the Valley of the Amazons. By F. D. Godman and O. Salvin.

[Received March 11, 1882.]

(Plate XIX.)

Some time ago Mr. A Maxwell Stuart, whilst travelling on the Upper Amazons, captured a magnificent specimen of an *Agrias*, a genus much prized by all lepidopterists both for its rarity and beauty. On his return to England he kindly made us a present of it; and as it proves to belong to a hitherto undescribed species, we have much pleasure in naming it after him.

Agrias stuarti, sp. nov. (Plate XIX. figs. 1, 2.)

Both wings deep purplish-blue, bordered outwardly with a narrow metallic green band, beyond which it is greyish; primaries with costa and apex black, this colour extends along the outer margin towards the posterior angle, where it fades into grey; secondaries with costal region and inner margin broadly black: beneath, primaries black, apical third metallic green, reddish orange towards the base; secondaries, basal half orange, outer half metallic green with three rows of black spots parallel to the outer margin, the middle one having central white spots.

Exp. 3·7 inches.

Hab. Yquitos, Amazons (*A. Maxwell Stuart*).

Mus. nostr.

This insect is a close ally of *A. beatifica*, Hew., from which, however, it differs in the greater extension of the purplish-blue colour of the upper surface. Beneath there is but little difference, but the black spots of the secondaries are rather larger.

Mr. Stuart captured a single male example of this fine insect whilst it was pursuing a specimen of *Callithea buckleyi*, which resembles it both in colour and markings, and with which it appeared to be fighting. No doubt, like other members of the genus, it flies about the tops of the highest trees, settling on the foliage out of reach, and rarely coming near the ground[1]. *A. beatifica* has also a *Callithea* which is found together with it, and likewise resembles it in coloration; this is *C. degandii*, the sexes of which, though considerably different from each other, are alike in the two species.

Mr. Hewitson has given a very good figure of the male of *A. beatifica* in his 'Exotic Butterflies;' but the female (of which we have a single specimen procured by Mr. Hauxwell at Pebas on the Upper Amazons) differs so much that a short description and figure of it here may be desirable.

Agrias beatifica ♀. (Plate XIX. figs. 3, 4.)

Both wings black, with a broad metallic green band commencing

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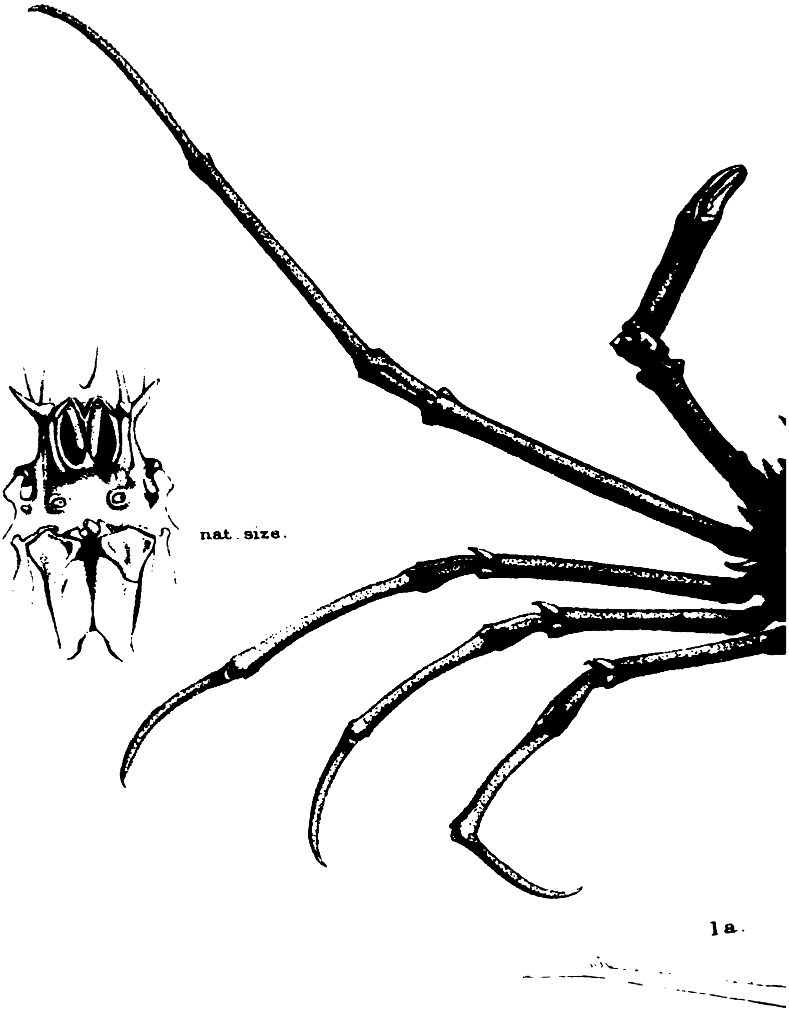
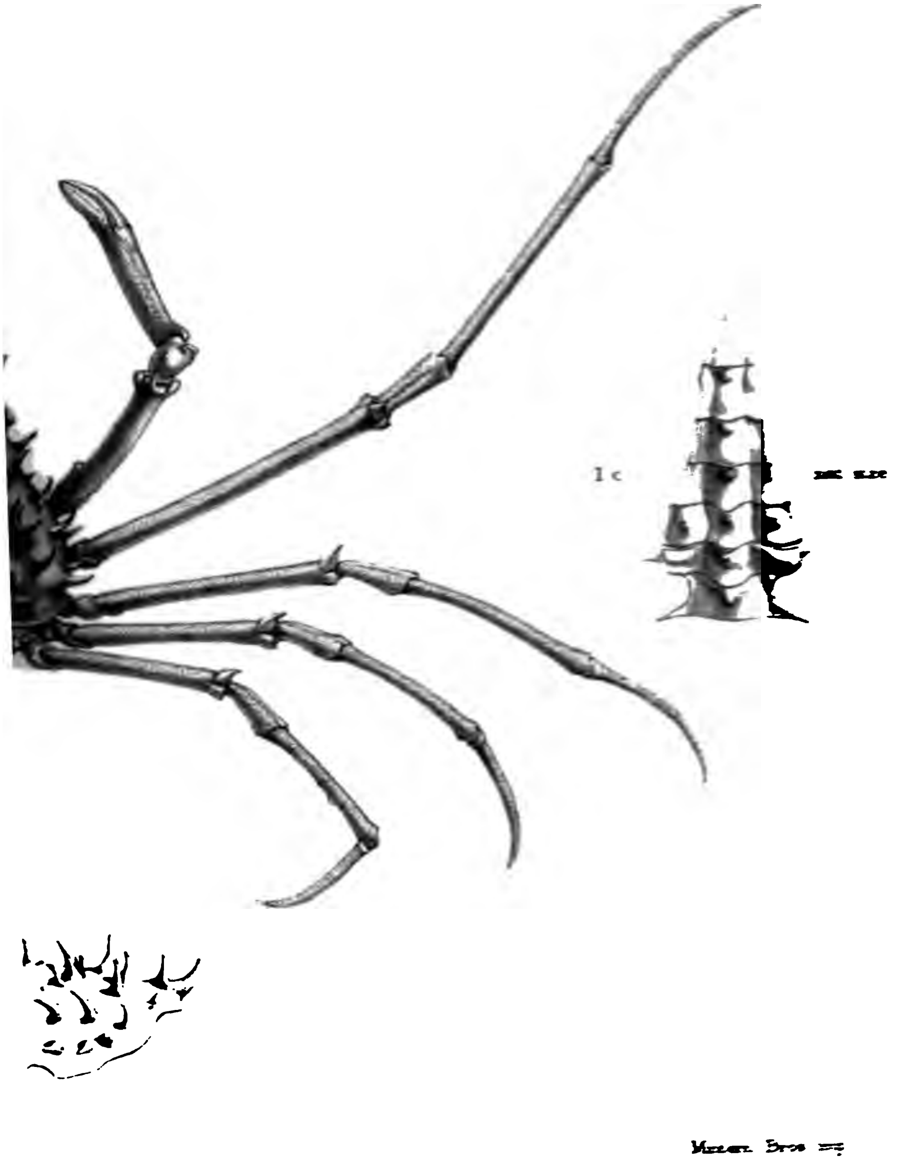
[1] On the habits of the other Amazonian species of *Agrias*, see Bates, Journ. Ent. ii. p. 337.



Edwin Wilson, del et lith.

NAXIA (NA

P. Z. S. 1882. Pl. II



Mintern Bros imp.

OBILLARDI.

at the end of the cell of the primaries, and passing in a bow to the anal angle of the secondaries, beyond this towards the outer margin fading into grey, apices of primaries narrowly tipped with black: the underside resembles that of the male; but the colours are paler, and the base of the wings is of a tawny yellow instead of a reddish orange.

EXPLANATION OF PLATE XIX.

Fig. 1. Upperside of *Agrias stuarti* ♂.
2. Underside of *Agrias stuarti* ♂.
3. Upperside of *Agrias beatifica* ♀.
4. Underside of *Agrias beatifica* ♀.

6. On some Crustaceans collected at the Mauritius.

By Edward J. Miers, F.L.S., F.Z.S.

[Received March 15, 1882.]

(Plate XX.)

The Crustaceans which I have now the pleasure of bringing before the notice of the Society were obtained at the Mauritius by M. Robillard, and recently forwarded by him to the British Museum. They are:—(1) a fine Spider-crab, described below as *Naxia robillardi*, which was dredged at a depth of 30 fathoms [that such a large and interesting a species should have remained so long unnoticed is very remarkable; and I can only account for it on the supposition that this crab lives habitually at considerable depths, and hence has escaped the notice of collectors of the littoral forms, most of which are well known]. (2) an example of *Neptunus sieboldi*, A. M.-Edwards, a swimming crab hitherto a desideratum to the national collection; and (3) several specimens of a Hermit Crab which I think is *Cœnobita perlata*, M.-Edwards: although having the inferior surface of the joints of the first three legs very hairy, these specimens in all other particulars coincide with M.-Edwards's brief description in the 'Histoire naturelle des Crustacés' (ii. p. 242, 1837), and with the excellent figure in the large illustrated edition of Cuvier's 'Règne Animal' (pl. xliv. fig. 1).

In order to complete the account of the Crustaceans received from the Mauritius through M. V. de Robillard, I have added a brief notice of a fossorial Crustacean of which two examples, both unfortunately imperfect, were sent two years ago to the British Museum by the same collector, and which I propose to designate *Callianassa mauritiana*.

Naxia (Naxioides) robillardi, sp. n. (Plate XX. fig. 1.)

The carapace is subpyriform, rather convex, and covered with long stout conical spines; of these spines about 13, situated on the gastric region, are arranged in three somewhat irregular transverse series, behind and in front of which are some smaller spines;

2 are placed on the cardiac region, of which the posterior is very large, 3 (very large) on the intestinal region, 2 on each hepatic region, and about 7 on each branchial region, besides the marginal spines, of which there are 5 ; 3 are placed on each pterygostomian region, the anterior of which is situated at the antero-lateral angle of the buccal cavity ; there is also a distinct but not very large præocular spine. The orbits are rather small, with a lateral aspect, and with two fissures above and a large hiatus below. The spines of the rostrum are subcylindrical and very long (in the male as long as the carapace), straight, and very slightly divergent distally ; they bear an accessory spine on their upper surface at some distance from the distal end, which is acute. The basal antennal joint is longer than broad, and bears a strong spine, directed obliquely downward, at its antero-external angle ; the next joint is slender and very much elongated, the third also slender ; these joints and the flagellum are scarcely visible in a dorsal view. The epistoma is large, but broader than long ; the ischium joint of the outer maxillipedes is longer than broad ; the merus joint truncated at its distal end, and with only a very small notch at its antero-internal angle above the place of articulation with the next joint. The chelipedes in both sexes are slender ; in the male, however, somewhat more robust than in the female ; the merus joint is cylindrical, elongated, with a strong spine above at its distal end. Carpus short, armed on its upper and outer surface with two or three small spines or tubercles ; palm smooth, subcylindrical (in the male about 3½ times as long as broad) ; fingers slender, more than half as long as the palm, somewhat incurved, having between them when closed (in the male) a small hiatus at base ; both fingers in their distal halves are denticulated and meet along their inner edges ; the mobile finger has in the male a tubercle on its inner margin near the base. The ambulatory legs are slender and much elongated, the first pair very much longer than the following ; there is a spine at the distal end of the upper surface of the merus joints in all the ambulatory legs. The dactyli, although shorter than the preceding joints, are yet elongated and slightly curved, and terminate in a small corneous claw. The segments of the postabdomen are all of them distinct in both sexes ; in the male all, except the last, have a small median spine, on each side of which, on the second and third segments, is a lateral spine ; in the female the first four are armed with a small median spine or tubercle. The animal is covered with a short dense yellowish-brown pubescence, which, however, is absent from the palms and fingers of the chelipedes, and partially so from the penultimate and terminal joints of the ambulatory legs, the ground-colour of the integument being, in these places, in the two dried specimens I have examined, purplish-red. Length of the carapace to the base of rostral spines in an adult male about 2⅔ inches (68 mm.), which is also the length of the spines themselves ; of a chelipede about 4½ inches (113 mm.), of the first ambulatory legs nearly 9½ inches (242 mm.).

Two specimens, a male and a female, were collected. In the female the carapace is somewhat more pyriform and convex, the rostral spines shorter, the chelipedes rather slenderer, and the first pair of ambulatory legs somewhat less elongated.

The nearest ally to this species with which I am acquainted is *Naxia* (*Naxioides*) *petersii* (*Podopisa petersii*, Hilgendorf, Monatsb. Ak. Berlin, p. 785, pl. i. fig. 5, 1878), from Mozambique, which is very probably identical with *Naxioides hirta*, Alph. M.-Edwards (Ann. Soc. Entom. France, ser. 4, v. p. 143, pl. iv. fig. 1, 1865), from Zanzibar. *N. robillardi* is at once distinguished by its greater size, by having the carapace covered with strong conical spines in the place of small irregular tubercles, and by the double hiatus in the upper orbital margin. In the last-mentioned character it resembles certain species of *Pisa* (e.g. *Pisa* (*Arctopsis*) *lanata*); but it is distinguished from that genus by the greater length and slenderness of the chelipedes and first ambulatory legs, by the narrower basal antennal joint, and the accessory spines of the rostrum; yet it may be regarded as establishing a transition to *Pisa*.

In my revision of the Maioidea[1] I adverted to the insufficiency of the characters assigned to *Naxioides*, A. M.-Edw. (*Podopisa*, Hilgendorf) for distinguishing this genus from *Naxia*. As the species now described has a distinct præocular spine, even this character can no longer be cited as peculiar to the last-named genus.

CALLIANASSA MAURITIANA, sp. n.

Both the specimens sent by M. Robillard are imperfect; and the large chelipede, from which the principal distinctive characters are derived, does not appear to belong to either example, but to a distinct and larger individual. In the analytical table appended to M. A. Milne-Edwards's monographic revision of the genus *Callianassa*[2], our new species will be arranged with *Callianassa subterranea* and *C. longimana*, inasmuch as there exists a small median rostral tooth, the terminal segment of the postabdomen and the eyes are well developed, and there is a tooth or lobe, which is itself denticulated, at the proximal end of the inferior margin of the merus joint of the larger chelipede, whose penultimate joint or palm about equals the wrist in width. It is distinguished from both the abovementioned species, however, by the broad spinulose inferior basal lobe of the arm or merus, and by having the distal end of the palm between the bases of the fingers deeply excavated as in *C. californiensis* and *C. uncinata*; the inferior margin of the merus is armed with small granulations; the carpus (in the large chelipede) is somewhat shorter than the palm, with its upper margin acute; the palm, which is not once and a half as long as broad, narrows very slightly toward the distal end, its upper margin is rounded, except at its proximal end; the lower margin, both of wrist and palm, is minutely serrated; the upper or mobile finger is longer than the lower, and is sharply uncinated at its distal end, it has a strong blunt tooth on its inner margin near the base. I may add that the

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[1] Journ. Linn. Soc., Zool. xiv. p. 658 (1879).

[2] Nouvelles Archives du Muséum, vi. p. 101 (1870).

terminal postabdominal segment is shorter than in *C. subterranea*, not as long as its greatest width. Length about 3 inches 10 lines (98 mm.); of the larger chelipede, from the base of the merus joint to end of the dactylus, about 2 inches 10 lines (72 mm.).

From the American *C. californiensis* and *C. uncinata*, this species is distinguished by the much longer palm of the larger chelipede, and the much broader, less prominent, denticulated basal lobe of the arm or merus.

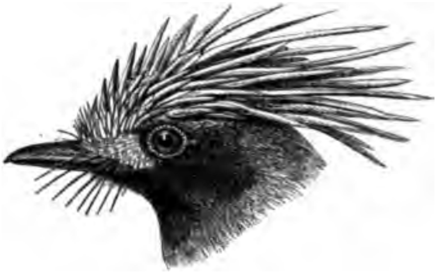
EXPLANATION OF PLATE XX.

Fig. 1. *Naxia* (*Naxioides*) *robillardi* (p. 339), adult male, reduced to about half natural size.
1*a*. Lateral view of the carapace of the same in outline, showing the elevation of the dorsal spines, reduced about half natural size.
1*b*. Antennal, orbital, and buccal regions of the same, viewed from below, natural size.
1*c*. Postabdomen of the same, natural size.

April 4, 1882.

Professor Flower, LL.D., F.R.S., President, in the Chair.

Mr. Sclater exhibited what appeared to be an adult male example of *Cyanomyias cœlestis* (Sharpe, Cat. Birds, iv. p. 278), which belonged to the Museum of Zurich, and had been sent to him for determination by Dr. Moesch, of that city. Mr. Sclater remarked on the more brilliant colours and finely developed crest of the male of this species, which rendered it readily distinguishable from the female example (figured by Lord Tweeddale, P. Z. S. 1878, pl. vii. fig. 1), the only specimen hitherto known of this superb Flycatcher. The present example was received from Manilla, but was probably originally from Dinagat, as the type specimen, now in the collection of Mr. Wardlaw Ramsay, had been procured in that island. Besides the highly developed crest and more brilliant



Head of *Cyanomyias cœlestis* ♂.

colours, the male seemed to have the lazuline blue of the throat carried entirely over the breast, instead of being confined to the throat.

Mr. Sclater laid before the Meeting the skins of the two specimens of the Subcylindrical Hornbill (*Buceros subcylindricus*), which had been formerly living in the Society's Gardens[1], and stated that a re-examination of these specimens had confirmed his opinion as to the validity of the species. In the second specimen, which had died on the 9th June 1881, although the tail was imperfect, it was manifest that the two central tail-feathers were black almost to their tips as in the first specimen; and the well-defined ashy margins of the feathers on both sides of the head were alike in both examples. It was likewise of great interest to find that an example of this Hornbill had been recently received by the Imperial Museum of Vienna[2] in a collection made by Dr. Emin Bey between Lado and the Albert Nyanza in Central Africa, so that we were now acquainted with the true locality of this rare species.

Mr. Sclater proposed to arrange for the deposit of these typical specimens in the British Museum.

The following papers were read :—

1. Description of a new Species of Tortoise (*Geoemyda impressa*) from Siam. By Dr. A. GÜNTHER, V.P.Z.S.

[Received March 20, 1882.]

The British Museum has received from Siam the shell of a fresh-water Turtle without any other part of the animal, which seems to be undescribed. It is 11 inches long; and sufficiently resembles the shells of *Geoemyda spinosa* and *G. grandis* to warrant the supposition that this species belongs to the same genus. It may be named *Geoemyda impressa*, from the peculiar shape of the principal upper plates, which are not merely flat, but distinctly concave.

The shell is much depressed and broadly flattened above. Its anterior margin is deeply excised in front of the nuchal plate, and serrated ; also the lateral marginals project slightly at their posterior corners, and the hind margin is deeply and regularly serrated. The plates are nearly smooth ; but concentric striation is distinct, especially on the costals. Of a vertebral keel the faintest possible trace is visible on the fourth or fifth vertebral. The sternum is excised in front, and deeply notched behind ; its width between the front

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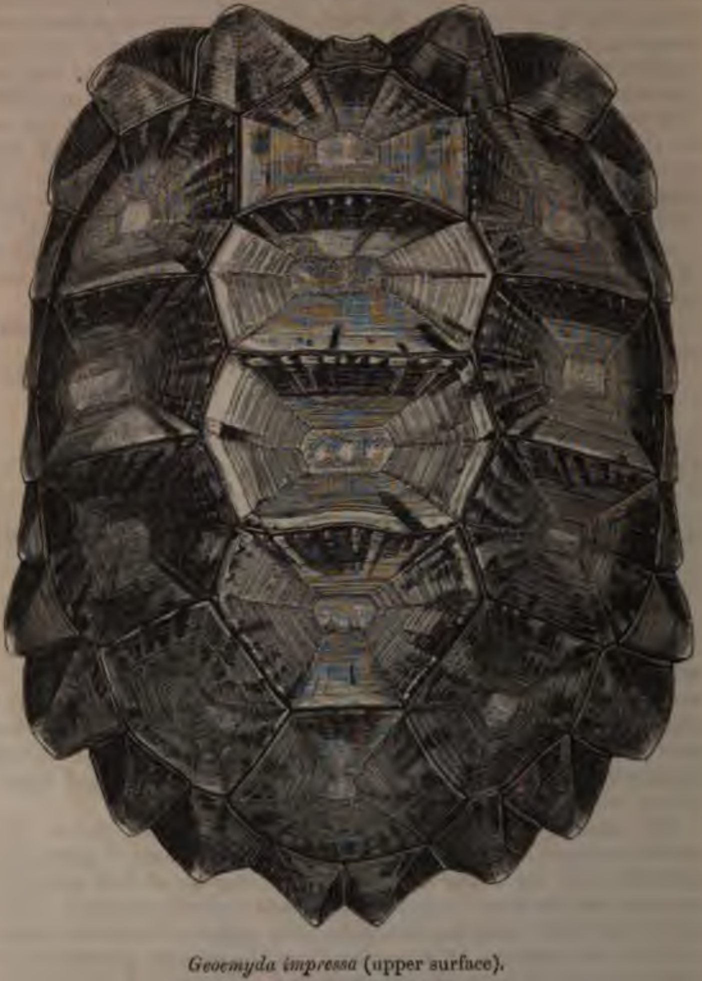
[1] See P. Z. S. 1870, p. 668, pl. xxxix. ; 1871, p. 489, and 1879, p. 550.

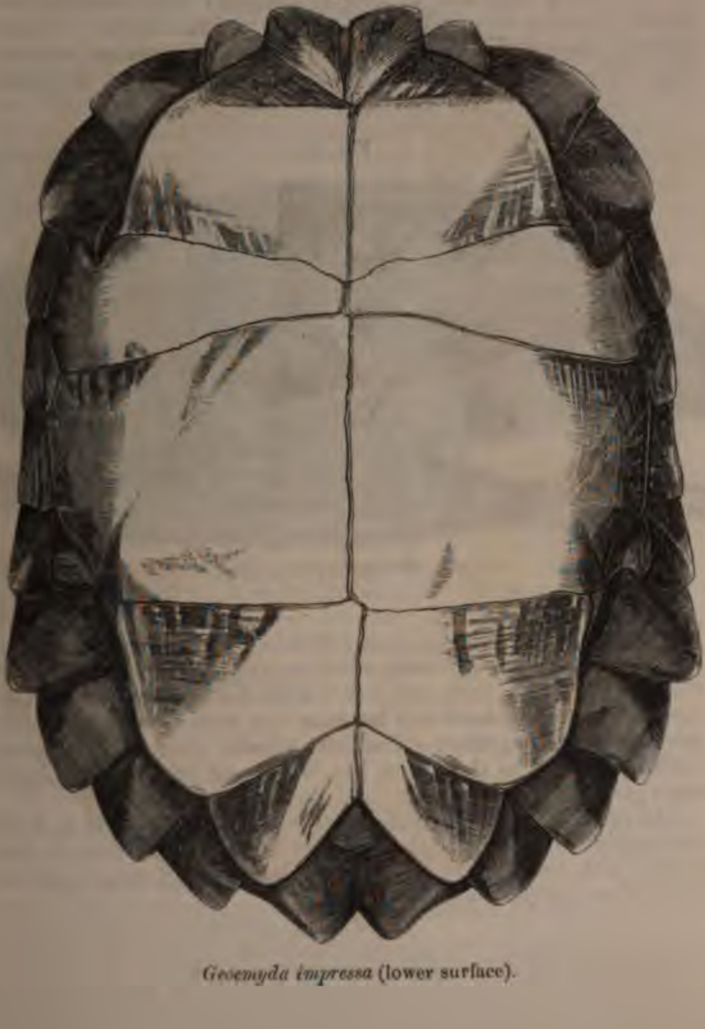
[2] *Cf.* Von Pelzeln, "Ueber eine Sendung von Vögeln aus Central-Afrika," Verh. k.-k. zool.-bot. Gesellsch. Wien, 1881, p. 153.

Fig. 1.



Geoemyda impressa (upper surface).

Fig. 2.

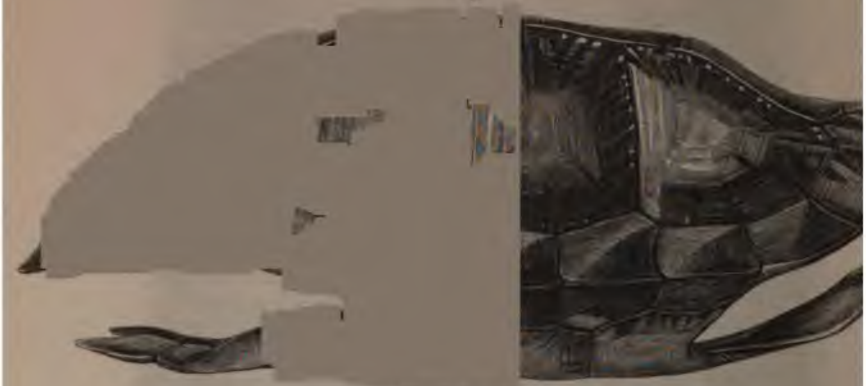


Geoemyda impressa (lower surface).

incisions is equal to that between the hinder, and a little more than one half of its length.

Areolæ distinct. Nuchal plate broad, much broader behind than in front, with truncated anterior margin. First vertebral much broader than long, concave, with parallel lateral margins; second, third, and fourth very much broader than long; posterior margin of the fourth only half as long as anterior; fifth vertebral but slightly broader than long, and rather convex behind. Caudal divided. Costals deeply impressed in their areolar portion, more so than the vertebrals. Gulars subrhomboid, but rather irregular, joined at an obtuse angle in front and behind. Postgulars enlarged at the expense of the pectorals, which are very narrow, the length of their median suture being only one fourth of the suture between the postgulars. Abdominals very large, as long as the preceding three pairs of plates together. Præanals broader than long. Anals similar in shape to the gulars, but larger, and joined at an acute angle posteriorly.

Fig. 3.



Geoemyda impressa (side view).

The prominent colour is yellow in the areolar portion, but each of the vertebral, costal, and sternal plates is ornamented towards the margin with broad black radiating bands, and the anterior half or third of each of the marginals is black.

2. On the Convoluted Trachea of two Species of Manucode (*Manucodia atra* and *Phonygama gouldi*); with Remarks on similar Structures in other Birds. By W. A. FORBES, B.A., Prosector to the Society.

[Received March 21, 1882.]

The subcutaneous convolution on the pectoral muscles of the trachea in the Manucodes of the genera (or subgenera) ***Manucodia*** and *Phonygama*, originally described and figured by Lesson in *Phonygama keraudreni* so long ago as 1826[1], has lately excited considerable attention, Prof. Pavesi[2] having shown that a similar structure, though less developed, exists in ***Manucodia chalybeata***, and Dr. Meyer[3] having demonstrated the same for its representative form ***M. jobiensis***. From their figures and observations it is clear:—

1. That the trachea of *Phonygama* "*keraudreni*"[4] *may* be convoluted in both sexes, that of the males being most complicated, consisting, when best developed, of a complete spiral of several coils, whilst in younger males, and females, it is reduced to a simple loop with a bend to the right.

Intermediate forms of all kinds are to be found, as shown by Pavesi's interesting series of figures.

2. That in *Manucodia chalybeata* and *M. jobiensis* the adult males possess a trachea provided with a simple loop, extending about two thirds down the surface of the pectoral muscles. This is apparently absent in the females and young males.

The specimen, a male, of *Manucodia atra*, purchased by the Society on March 19, 1881[5], having died on March 11th inst., I have now been enabled to examine the condition of the trachea in this species also. As will be seen from the drawing I exhibit (figure, p. 348), representing it *in situ*, it too is convoluted, but to a much smaller extent, only forming a short loop lying on the interclavicular air-cell, between the rami of the furcula, much as in many specimens of the genus *Crax*. This quite confirms D'Albertis's description given by Count Salvadori[6]. In the female the trachea will probably be found to be quite simple.

Of *Phonygama gouldi*, the Australian representative of ***P. keraudreni***, I have been enabled to examine three detached tracheæ, as well as three entire birds collected at Cape York by H.M.S.

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[1] Voyage de la 'Coquille,' Atlas, pl. xiii. fig. 2.

[2] Ann. Mus. Genova, vi. pp. 313–324, pl. x., and ix. pp. 66–77.

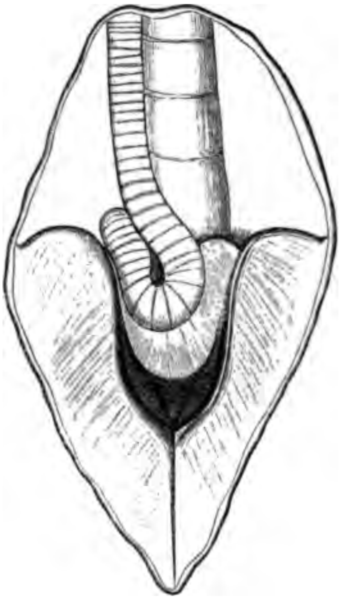
[3] Abbildungen Vogel-Skeleten, pl. vii. *a*, p 5.

[4] All but one of Pavesi's specimens (fig. 6 of his second paper) are, it is to be observed, really *P. gouldi*, having been obtained at Cape York by D'Albertis.

[5] On its arrival it was supposed to belong to the species *M. viridis* (seu *chalybeata*), and was noticed as such (P. Z. S. 1881, p. 450).

[6] "Non pare che questa specie possegga vere circonvoluzioni externe della trachea, ma, secondo le osservazioni del D'Albertis, i maschi adulti avrebbero *soltanto un' ansa piegata* ad S nella fossetta della forchetta." -*Ornitologia della Papuasia e delle Molucche*, ii. p. 509.

'Challenger,' and kindly intrusted to me by the late Sir Wyville Thomson. The first three are those already mentioned by Mr. Tegetmeier in his appendix to the 'Natural History of the Cranes'[1]. All are convoluted, though that of the female specimen is least so, and those of the two males vary slightly in the amount of convolution. They very closely resemble that of *P. keraudreni* figured on p. 68, fig. 2, in the second of Prof. Pavesi's papers already quoted, but have eight instead of nine folds, counting along a transverse line drawn through the centre of the coil. Of the three 'Challenger' birds, one, a female[2], has a trachea with a single curved loop, like Pavesi's fig. 8, whilst in the two others the trachea is quite straight, with no trace of a curve. One of these is a *male*, probably young, whilst the other is an *adult* female, as shown by the oviduct containing an egg nearly ready to be laid.



Trachea of *Manucodia atra.*

It is clear therefore that in this species, too, the female *may* sometimes have no tracheal loop at all.

As regards the habits of *P. gouldi*, I reproduce here some extracts from the notes accompanying the receipt of the first three tracheæ sent—I believe, by Dr. George Bennett of Sydney—the substance of which Mr. Tegetmeier has already published (from the original MS. in my possession) in his work on Cranes:—

[1] London, 1881, pp. 87, 88.

[2] One of the specimens referred to in Mr. Murray's notes, *cf.* 'Voyage of H.M.S. Challenger,' Report on the Birds, p. 87.

"Having recently purchased a pair of those elegant birds, the *Manucodia gouldi*, which had been shot at Cape York by Mr. J. A. Thorpe (now taxidermist to the Sydney Museum), he directed my attention to the peculiar formation of the trachea in them, some of which he has preserved in a dried state and presented to me; of these I have sent you three, one from a female and two from males. That of the female is much smaller in size than those of the males; and even in the males the convolutions assume different forms. This formation of the vocal organs enables the male bird to utter a very loud and deep guttural sound, indeed more powerful and sonorous than any one would suppose so small a bird could be capable of producing. Mr. Thorpe states to me that it was a long time before he could believe that so powerful a sound emanated from this bird. No information could be obtained respecting the note of the female, as only that of the male was heard. These birds were found about the same locality as the two fine species of Rifle-birds obtained also at Cape York—*Ptilorhis alberti* and *P. victoriæ*.

"Mr. Thorpe gave me some information respecting the habits of these birds as follows:—'During a residence of seventeen months at Cape York in 1867 and 1868 I shot several of the *Manucodia gouldi*, and took particular notice of their habits. They frequent the dense palm-forests, and are usually seen high up in the trees; they utter a very deep and loud, guttural note, rather prolonged, and unlike that of any other bird with which I am familiar. Their movements are particularly active and graceful; on approaching them they evince more curiosity than timidity, looking down at the slightest noise, and apparently more anxious to obtain a full view of the intruder than for their own safety. They are almost invariably in pairs; and both birds can generally be secured.'"

I may remark that, in all the specimens of the convoluted trachea in *Manucodia* and *Phonygama* I have seen, the descending limb of the loop in the natural position of the bird is to the left, the ascending to the right. The same peculiarity is observable in all the figures yet published, excepting the original one of Lesson, and in one of those of Pavesi (*l. c.* ix. p. 64, fig. 4). The reversal, in the first figure, is obviously due to the trachea being represented from the *dorsal*, instead of the ventral aspect, it being represented as quite separated from the body: Pavesi's figure, representing the parts *in situ*, does not admit of this explanation, if correctly drawn.

As regards the two forms *Phonygama* and *Manucodia*, which Mr. Sharpe adopts as genera in the 'Catalogue of Birds,' vol. iii. pp. 180, 182, it is interesting to observe that the validity of the separation is confirmed by what we now know of the tracheal conformation of the two groups in question.

Phonygama (as represented by *P. keraudreni* and *gouldi*) has the trachea (at least usually) convoluted in *both* sexes, that of the adult male being spirally convoluted several times, whilst that of the female forms a single curve with a loop to the right. *Manucodia* (in *M. chalybeata*, *jobiensis*, and *atra*), on the other hand, has the trachea convoluted in the male only, the convolution being in the form of a simple loop, extending, in the first two species, onto the pectoral muscles, but confined in *M. atra* to the interclavicular area.

As regards the occurrence of convoluted tracheæ in the class Aves generally, it may be useful to give as complete a list as is in my power of all the hitherto recorded instances. Pavesi has already (*l. c.* vi. pp. 317, 318) given such a list, compiled from various authors; but the opportunities for observation of my predecessor and myself have enabled me to give, as will be seen below, a much fuller and more complete one. I have endeavoured to state exactly in what species this convolution has been observed, or has been found to be absent, as well as to state precisely the sexes of the individuals presenting the peculiarities. Unless otherwise stated, the observation has been made by Prof. Garrod or myself.

A. The convolutions of the trachea are superficial, lying beneath the skin, extending often more or less onto the pectoral, or even abdominal, muscles.

OSCINES.

Phonygama keraudreni. ♂ [Lesson, Pavesi, Meyer]. [Probably ♀ also.]

—— *gouldi.* ♂ : present, much less developed (sometimes absent) in ♀.

Manucodia chalybeata. ♂ [Pavesi, Meyer].
—— *jobiensis.* ♂. [Condition in ♀ not known.]
—— *atra.* ♂. [Condition in ♀ not known.]

At present it has been found in the males only of these three species, and, as already indicated, is, from Beccari's observations on *M. chalybeata*, probably absent altogether in the females.

Fam. ANATIDÆ.

In the males of *Anseranas melanoleuca* the trachea forms a very extensive double loop, extending to quite the end of the pectoral muscles. The female has simply a slight bend in the neck.

Fam. SCOLOPACIDÆ.

The *females* only of *Rhynchæa australis* [according to Gould] have a convoluted trachea, forming several folds on the pectoral muscles, and extending onto the abdomen. In the *males* it is simple[1].

In *R. capensis*, as Mr. Wood-Mason has lately shown (P. Z. S. 1878, pp. 745–751, pl. xlvii.), the mature females only have a slightly extrathoracic loop, the trachea of the younger females and of the males being quite simple.

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[1] Two specimens showing different degrees of development of this structure may be seen mounted in the Hunterian Museum (Preps. 1156. D & E).

Fam. CRACIDÆ.

In the males of the genera *Crax*, *Pauxis*, *Mitua*, and *Ortalis* the trachea forms a loop of variable extent, often extending, particularly in the last three genera, to the end of the *carina sterni*, and then turning up a little way on the left side before it returns. In other cases it extends only about as far as the anterior end of the *carina*. In the females this loop is altogether absent, or at most the trachea presents a slight curve in the neck.

Species examined.

Crax globicera. ♂, ♀.
—— *alector*. ♂, ♀.
—— *sclateri*. ♂, ♀.
—— *daubentoni*. ♂, ♀.
—— *alberti*. ♂, ♀.
—— *carunculata*. ♂, ♀.

[The females only of *C. globulosa* and *C. incommoda* have yet been examined. The trachea is simple.]

Pauxis galeata. ♂, ♀.
Mitua tuberosa. ♂, ♀.
—— *tomentosa*. ♂, ♀.
Ortalis albiventris. ♂, ♀.
—— *garrula*. ♂. [The ♀ according to Humboldt[1] has the trachea simple.]
—— *motmot*. ♂. [The female has a simple trachea according to Latham, who describes this species[2] under the name of *Phasianus parraka*.]

In *Penelope jacucaca* the trachea is convoluted in *both* sexes; and the same is the case in the male of *P. pileata*, the condition of the female being unknown.

[In *Penelope cristata* and *P. purpurascens* the male has *no* loop; and the same is the case in *Pipile cumanensis* and *P. jacutinga*. Only females of *Pipile cujubi* and *Nothocrax urumutum* have yet been examined: these had simple tracheæ; and the same is the case in *both* sexes of *Aburria carunculata*.]

B. The trachea has a considerable superficial loop in the cervical region, anterior to the thoracic muscles.

Fam. PHASIANIDÆ.

Tetrao urogallus. The male only, apparently.

C. The trachea has a loop entering into, and inclosed by, a bony cavity formed by the clavicular symphysis.

Fam. NUMIDIDÆ.

The Guinea-fowls of the genus *Guttera*, as seen in both sexes of *Guttera cristata* and *G. pucherani*. The same conformation occurs in *G. eduardi*; but the sex of my specimen is not, unfortunately, recorded.

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[1] Humboldt and Bonpland, 'Recueil d'observations de Zoologie,' &c. p. 5. Paris, 1811.

[2] Linn. Trans. iv. p. 100 &c.

[In *Numida* proper (*N. meleagris, ptilorhyncha,* and *mitrata* have been examined), as well as in *Acryllium vulturinum*, the trachea is quite simple in both sexes.]

D. The trachea has several *intrathoracic* convolutions.

Fam. CICONIIDÆ.

Tantalus ibis, in the male (*cf.* Garrod, Coll. Papers, p. 286).

[The condition of the female is unknown.]

[In both sexes of *T. loculator*, as well as in the females of *T. leucocephalus* (the other sex not yet having been dissected) the trachea is unconvoluted.]

Fam. IBIDIDÆ.

Platalea leucorrodia. ♂. (♀, Nitzsch).

[In *Ajaja rosea* the trachea is known to be simple in both sexes, though the bronchi are peculiarly long. *Cf.* Garrod, *l. c.* p. 288.]

E. The trachea is convoluted, the convolution impinging on, or entering, the *carina sterni*.

Fam. CYGNIDÆ.

In the Swans of the *Cygnus ferus* group, the trachea, as has long been known, has a number of *intrasternal* convolutions, which may extend to near the end of the bone.

This is well known to occur in both sexes of *Cygnus ferus*: it is likewise the case in both males and females of *C. buccinator*, *C. americanus* (according to Macgillivray, Sharpless, &c.), and *C. bewicki* (Yarrell).

[In *Cygnus olor*, *C. immutabilis* (Macgillivray), *C. nigricollis*, and *C. coscoroba* the trachea is quite simple in both sexes.]

According to Yarrell, in *Cygnus atratus* there is a slight downwardly-directed loop of the trachea in the interclavicular region.

Fam. GRUIDÆ.

The genus *Grus*, as a rule in both sexes, possesses a convoluted trachea, which usually enters the *carina sterni*, which it may excavate to its posterior extremity. The amount of convolution varies much in different specimens of the same species.

Species examined.

Grus cinerea. ♂, ♀. (Yarrell, &c.)
—— *antigone*. ♂ (Tegetmeier). ♀.
—— *americana*. ♀ (*cf.* Roberts, Am. Nat. 1880).
—— *carunculata*. ♂, ♀.
—— *leucogeranos*. ♂, ♀.

As regards these two species, it appears from Prof. Garrod's MS.

notes that the male of *G. leucogeranos* has a convoluted trachea, only slightly folded in the *carina sterni*, extending in it for less than half its extent[1]; whilst in the female " there was formed a genu of small size, that does not enter the *carina sterni*." The female of *G. carunculata* examined had a trachea as well convoluted as the most developed forms of *G. americana*, whilst in the male the condition was as in the female of *G. leucogeranos*.

Grus australasiana. ♂ [? ♀].

——— ***canadensis.*** ♂.

In *Tetrapteryx paradisea*, according to Yarrell and Tegetmeier, as well as in *Anthropoides virgo* according to Parsons and Yarrell, the trachea is convoluted, but does not enter the *carina sterni*, being contained in a special groove developed along the anterior margin of that bone.

[In both species of *Balearica* the trachea is known to be quite simple; and the same is probably true in *Aramus scolopaceus*.]

3. On the Eggs of some rare Wading Birds from Madagascar.

By J. E. Harting, F.L.S., F.Z.S.

[Received March 21, 1882.]

Amongst a large collection of eggs recently brought from Madagascar by the Rev. W. Deans Cowan, many of which are of considerable interest as being hitherto undescribed, are the eggs of three species of *Limicolæ* which I should like to bring before the notice of this Society, since they belong to members of a group to which I have for some years been paying special attention.

Mr. Deans Cowan collected in the neighbourhood of Fianarantsoa in the Betsileo country, situated in the south central portion of Madagascar; and the extent of his collection shows how rich a field for ornithologists is the district in which he has for some years resided.

The three species of Wading-birds of which I now exhibit the eggs, as well as the skins, are a Pratincole (*Glareola ocularis*, Verreaux), a Sand-Plover (*Ægialitis geoffroyi*, Wagler), and a Snipe (*Gallinago macrodactyla*, Bonaparte). The Pratincole and Snipe, which so far as I am aware have not been met with out of Madagascar, are both very rare in collections; the Sand-Plover, being generally distributed throughout Southern Asia, the Malay Archipelago, and Eastern Africa, is very much better known.

1. Glareola ocularis, Verreaux, was first brought to the notice of naturalists by the late Jules Verreaux so long ago as 1833, when at a meeting of the South-African Institution at Cape Town in that year he exhibited and described a specimen, which, with other skins, he had then lately received from Madagascar.

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[1] The observations of Mr. A. O. Hume (*cf.* Tegetmeier's 'Cranes,' p. 39, &c.) do not, therefore, always hold good for this species.

mere identification of the species under the name bestowed upon it by Pucheran (Rev. Zool. 1845, p. 279). Thus, it appears in a collection of Madagascar birds brought home by Mr. W. Gerrard, and described by Professor Newton in the 'Proceedings' of this Society, 1865, p. 832; it is noted as amongst the birds observed in Madagascar by M. Grandidier between the years 1865–67 (Rev. et Mag. de Zool. 1868, p. 4); and it appears again in a collection made in Madagascar by Mr. Crossley in 1869, and described by Mr. Sharpe, P. Z. S. 1870, p. 399.

Dr. Hartlaub has of course included it in both his works on Madagascar (Orn. Beitrag Faun. Madagasc. 1861, p. 78, and 'Die Vögel Madagascars,' 1877, p. 333); but little information is given concerning it beyond what had already been made known by Messrs. Roch and Edward Newton in their remarks on Madagascar birds, published in 'The Ibis' in 1863, where the fullest notice which has appeared of this bird is given.

These gentlemen state that they found it tolerably common along the coast, where it had evidently just been breeding, as Dr. Roch found a young one about four days old, on the 3rd October, between Tranomaro and Mamorack; unfortunately it was not preserved. In colouring it was said to approach the young of *Gallinago scolopacina* more than either *G. major* or *G. gallinula.*

In the valleys near Ambohitroni, about ninety-four miles from the coast, Messrs. Roch and Newton found it more numerous, and in about half an hour killed nine couple. Their flight was slow and steady, and they did not twist in the least. These were evidently not breeding. The largest measured was 19·25 inches in extent of wing, and 17·5 inches from the tip of the bill to the end of the tail.

According to Messrs. Roch and Newton sixteen appeared to be the normal number of tail-feathers in this Snipe, or two more than originally ascribed to the species by Bonaparte. Unfortunately, of the three specimens of this bird now before me, not one of them has the tail perfect, so that at present I am unable to check the observations of my predecessors upon this point.

With regard to the breeding of this species, Dr. Hartlaub has briefly described the egg (Vögel Madagascars, p. 335), and Dr. Roch, as already stated, found a young one which he was unable to preserve. I have now before me both egg and young, brought home by Mr. Deans Cowan from Fianarantsoa, Betsileo, where the bird is called *Kekakeka.* The native name *Rava-rava* referred to this species by Prof. Newton, in the Catalogue already referred to (P. Z. S. 1865, p. 832), is, according to Mr. Deans Cowan, properly applicable to the Painted Snipe (*Rhynchæa capensis*).

The egg, which measures 1·7 inch by 1·2 at its greatest diameter, is of a honey-yellow colour (Werner), spotted chiefly at the larger end with umber-brown.

The young bird when a few days old is scarcely to be distinguished from the young of our Common Snipe (*G. scolopacina*) at the same age, save for its greater length of bill, legs, and toes. As regards

It may be described as of a pale stone-colour, or, to be more accurate, of the colour described and figured by Werner in his 'Nomenclature of Colours' as cream-yellow, spotted or speckled chiefly at the larger end with yellowish-brown and paler brocoli-brown (Werner). It measures 1·4 inch by 1·1 at its greatest diameter. Only one nest was found, containing two eggs. The native name for this bird according to Mr. Deans Cowan is *Hitsikitsidrano*.

2. ÆGIALITIS GEOFFROYI, Wagler.

In 'The Ibis' for 1870 I gave as complete a life-history of this species as the materials then available enabled me to prepare, with a figure of the bird in its nuptial plumage. Reference to this account will show that the species is widely distributed and has frequently come under the observation of naturalists at the periods of its migration, or in its winter-quarters; but I was obliged to confess my inability to describe the egg (*tom. cit.* p. 383). Jerdon, writing of its habits in India, thought it "retired northwards to breed;" and Dr. Leith Adams believed he had found it breeding on the banks of the Chimouraree Lake in Ladakh (P. Z. S. 1859, p. 188), but the description of the bird given by him in his 'Wanderings of a Naturalist in India' (p. 283) shows that it was the closely allied, but smaller, *Ægialitis mongolica* that he met with. *Æ. geoffroyi*, according to Swinhoe, is abundant on the sandy shores of Formosa; and from the fact of the young being found in the island, he conjectured that it breeds there. There can be little doubt that it does so; for several eggs which he took there, and supposed to be those of the Eastern Golden Plover, *Charadrius fulvus*, are evidently too small for that species, and can only belong to *Æ. geoffroyi*. These eggs are now in the collection of Mr. H. Seebohm, and resemble those now exhibited from Madagascar.

As its smaller congener *Æ. mongolicus* does not occur in Madagascar, there is no ground for supposing that the eggs now exhibited can belong to that species; while the eggs of such other Sand-Plovers as are known to occur in the island are so much smaller in size, and so different in markings, that they cannot for a moment be confounded. *Æ. geoffroyi* is common enough in Madagascar, frequenting sandy shores and going up the rivers for some distance inland to breed.

The egg is of a cream-yellow, blotched chiefly at the larger end with pitch-black. It measures 1·4 inch by 1 inch.

The native name for this bird, and applied to all the Sand-Plovers which are found there, is *Vikiviki*.

3. GALLINAGO MACRODACTYLA, Bonaparte.

G. bernieri, Pucheran.

This Snipe, a very rare one in collections, is characterized by the unusually long toes, and by the extraordinary length of bill which distinguishes it from all its congeners.

Hardly any thing has been published concerning it beyond the in tint on the chest, breast, and under tail-coverts; bill brown, whitish on the lower margin and on the under mandible; no ring round the eye; ear-coverts and sides of the face like the head.

Length of skin 3·7 inches, wing 2·5, tail 1·9, tarsus 0·7; bill from forehead 0·5, from anterior margin of nasal groove 0·3, from gape 0·6.

The flank-plumes are rather elongated and somewhat decomposed.

Hab. Aru Islands?

April 18, 1882.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The following report on the additions to the Society's Menagerie during the month of March 1882 was read by the Secretary:—

The total number of registered additions to the Society's Menagerie during the month of March 1882 was 54, of which 26 were by presentation, 16 by purchase, 3 by birth, and 9 were received on deposit. The total number of departures during the same period, by death and removals, was 81.

The most noticeable addition during the month was:—

A Radiated Fruit-Cuckoo (*Carpococcyx radiatus*) from Sumatra, purchased March 31st.

The gait and actions of this remarkable Ground-Cuckoo remind one more of a Gallinaceous bird or a Gallinule than of any of its arboreal relatives of the same family. The form is quite new to the Society's Collection.

The following papers were read:—

1. On the Mutual Affinities of the Animals composing the Order EDENTATA. By WILLIAM HENRY FLOWER, LL.D., F.R.S., Pres. Zool. Soc., &c.

[Received April 4, 1882.]

The name assigned to this order by Cuvier is often objected to as inappropriate, as, though some of its members are edentulous, others have very numerous teeth; and the Linnean name *Bruta* is occasionally revived by modern authors. But that term is quite as objectionable, especially as the group to which Linneus applied it is by no means equivalent to the order as now understood, but contained all the animals then known which are comprised in the modern orders *Proboscidea*, *Sirenia*, and *Edentata*, together with the Walrus, one of the *Carnivora*. If retained at all, it should rather belong to the *Proboscidea*, as *Elephas* stands first in the list of genera of *Bruta* in the 'Systema Naturæ,' and was probably in the mind of Linnæus when he assigned the name to the group.

Cuvier's order included the Ornithorhynchus and Echidna, animals of which the structure was then imperfectly known, but which are now by almost universal consent removed to an altogether different section of the class. Otherwise its limits are those now adopted. The name *Edentata*, moreover, is now so generally used, and its meaning so well understood as a conventional term, that it would be very undesirable to substitute any other for it. In fact similar reasons might be given for ceasing to use nearly all the current ordinal designations of mammals. It might be equally well objected that all the *Carnivora* are not flesh-eaters, many of the *Marsupialia* have not pouches, and so forth.

The few common characters by which the Edentata are associated are too well known to need repetition. The principal one is the absence of any trace of the typical heterodont and diphyodont dentition, found in a more or less modified form in all other placental mammals[1]. The one genus *Tatusia* presents a startling exception, in the presence of a set of milk-teeth, with (according to Burmeister) distinct roots implanted in separate alveoli, and (according to C. Tomes) distinct enamel-organs, if not enamel. This is one of the most important facts bearing upon the evolution of the Edentates yet discovered, though its full signification is not yet evident.

It is highly probable that most, if not all, of the existing Edentates are the very much differentiated representatives of a large group, the greater number of which are now extinct, and which have become so without ever attaining a high grade of organization. The great diversity of structure, the high degree of specialization to which many have attained, the paucity of species and even of individuals, their limited area of distribution, and their small size compared with known extinct forms, all show that they belong to an ancient and waning race, the members of which still hold their own either by the remoteness and seclusion of their dwelling-places, their remarkable adaptation of structure to special conditions of life, or by aid of the peculiar defensive armature with which they are invested. Their former history can, however, only be surmised, rather than read, at present; for though we have ample evidence of the abundance and superior magnitude of certain forms in the most recent and post-Tertiary geological age, and in one part of the world, beyond that time (*i. e.* in the true Tertiary period), and in other parts of the world than America, their fossil remains hitherto discovered are only fragmentary, giving a most imperfect idea of their actual condition, as well as affording no indications that serve to connect them with certainty to any other branch of the class.

The existing Edentates readily group themselves into five distinct families, of the limits of which there is no reasonable doubt. These are :—1. The BRADYPODIDÆ, containing two genera, *Bradypus* and *Cholæpus*. 2. The MYRMECOPHAGIDÆ, containing three distinct modifications, worthy of generic rank—*Myrmecophaga*, *Tamandua*, and prehension and mastication of food, they are quite as near, if not nearer, to the Anteaters. They may truly be regarded as intercalary types, bridging over the gulf which now exists between them. The teeth are certainly those of the Sloths, even to the actual number in most genera; but the diminution of that number in *Cœlodon* leads towards their total suppression in *Myrmecophaga*. In the lengthening of the anterior part of the skull in *Megatherium*, but more strongly marked in *Scelidotherium*, the commencement of the *Myrmecophaga* type is clearly seen; and that they had tongues longer and more protractile than those of existing Sloths (perhaps even prehensile, as Professor Owen suggests) is very probable. The vertebral column, ribs, sternum, and tail were far more Myrmecophagine than Bradypodine. In the scapula they possess a character which is shared by both Sloths and Anteaters but by no other mammal. The coracoid bone and the coracoid border of the scapula join over the coraco-scapular notch, converting it into a foramen. The recent discovery of clavicles in a rudimentary state in all three species of *Myrmecophaga*[1] adds another common character to the group, though perhaps not one of first-class importance. It must, however, be noted that in no species of *Manis* has any trace of a clavicle been found. The flattening of the femur, and development of a linear ridge along its external border, is common and peculiar to the Sloths, Anteaters, and Megatheres. The special characters of the manus in these three families are all derivations from a common type; but in this portion of their organization the Megatherioids show their relationship with the Anteaters much more than with the Sloths. In the mode of setting the foot to the ground, and in the absence of claws upon one or more of the outer digits, the likeness is most surprising. The manus of the Pangolins, on the other hand, although presenting some superficial resemblances, is formed on a different type, in most respects more conformable to that which is normal among mammals; but it has the peculiarity (which it shares with all known Carnivora) of connate scaphoid and lunar bones, and in the deep median clefts of the ungual phalanges it resembles *Perameles* among the Marsupials.

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[1] The Cetacea are possible exceptions; but embryological and palæontological researches appear to show that their dentition may be derived from the ordinary mammalian type.

Passing from this brief review of the osteological characters, we find in the arrangements of the arterial system of the limbs a close resemblance between the Sloths and Anteaters; and though the tail is so reduced in the former, its caudal artery is surrounded by a well-developed plexus, such as we could hardly account for, except upon the supposition that it were a remnant of a condition in which the tail resembles that of the Anteaters or Megatheres. In *Manis*, no *retia mirabilia* appear to be developed in connection with the arteries of the limbs—although one has been found, in at least one species, in the tail; but it is also present in animals as far removed as the Spider Monkeys.

A part of the organization to which it is natural to attach much importance in tracing affinities is that concerned in the reproductive function. The organs of both male and female Sloths and Anteaters are closely similar in structure, while those of *Manis* are formed upon a totally different type. In the former families the testes are placed exactly in the same situation, close to each other, lying on the rectum, between it and the bladder; the penis is quite rudimentary, consisting of a pair of small corpora cavernosa, not directly attached by their crura to the rami of the ischium, and having a glans scarcely larger than that of the clitoris of most mammals, and, as in birds and reptiles, without any true corpus spongiosum. The number and development of the accessory glands vary apparently in different species of both families.

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[1] See W. A. Forbes, P.Z.S. 1882, p. 287.

In the females of both Anteaters and Sloths the uterus is simple and globular, and the vagina, at least in the virgin state, is divided into two channels by a strong median partition. Lastly, the placentation, as far as it is known, if not identical, is similar in principle. The placenta of *Cholœpus* has been fully described by Turner; it is deciduate, and composed of a number of lobes aggregated into a dome-like mass. There is nothing in the descriptions, certainly less complete, of the placenta of *Tamandua* and *Cycloturus* to show any differences except in detail of form.

In *Manis*, on the other hand, the testes are totally different in position, lying in the inguinal canal. The penis is external and well developed. The uterus is truly bicornuate, the vagina not divided, and the placenta diffused and non-deciduate. All the organs and fœtal membranes are formed very much on the plan of those of the typical Ungulata, without a trace of the special peculiarities of the American Edentates.

As regards the tegumentary system *Myrmecophaga* closely resembles *Bradypus* in the character of its hairy covering; while *Manis*, in its very remarkable horny scales, shows a type entirely different from both and from every other mammal.

Many other minor considerations might be adduced; but I think I have brought forward enough to establish the fact beyond reasonable question, that *Manis*, if allied at all to *Myrmecophaga*, must have separated from the original common stock before this had given off the *Bradypodidæ*—or, in other words, that the Sloths and Anteaters, with the Megatherioids intervening, are far more nearly allied to each other than either is to the Pangolins.

It now remains to examine the position of the other families.

Dasypodidæ. In many respects this family is remarkably specialized, more particularly in the characters of the integumentary structures, in which it differs from all known mammals.

In dental characters it presents nothing fundamentally different from those of the Sloths. In lingual, salivary, and digestive organs, on the other hand, it is more nearly allied to the Anteaters, though presenting a less extreme form of modification, showing in fact one of the stages by which such modification may have been brought about. It is therefore so far a connecting link between these families.

In the extremely important character of the presence of interlocking accessory zygapophyses to the lumbar vertebræ, and in the structure of the sternum and sternal ribs, it follows the type of *Myr-*

mecophaga and *Megatherium*; but in the peculiar form and ankylosis of some of the cervical vertebræ, common to all existing members of the family, it stands apart from all other Edentates. In the presence of a clavicle it resembles the other American forms; but it differs in the shape of the scapula, and in the existence of a third trochanter to the femur. The structure of the extremities, especially the manus, presents many modifications, some of which are quite comparable to, though not identical with, those of the *Myrmecophagidæ*.

The reproductive organs differ in the presence of a largely developed copulating organ in the male, and of a simple vagina of corresponding length in the female; these, as long ago suggested by Professor Owen, appear to be correlated with the difficulties which would otherwise be interposed to sexual congress by the arrangements of the dermal armour, and which of course do not occur in the Sloths and Anteaters. The testes are still abdominal, though not in the same position; and the penis, notwithstanding its size, wants (as pointed out by Morrison Watson[1]) both the glans and bulb, generally formed in mammals by the corpus spongiosum. The uterus is as simple, or nearly so, as that of the Sloths and Anteaters; and there is no reason to suppose, from what is at present known, that the placentation differs in principle from that of those families; for if deciduate, whether the whole mass assumes an oval, discoidal, or bell-shaped form is only a matter of detail.

The Armadillos, then, have undoubtedly near affinities to the other American Edentates, and are probably members of the same group, though not so nearly related to either of the other families as they are to each other, and are moreover remarkably specialized in a particular direction. The Glyptodonts form an allied group, agreeing in most essential features, but also presenting some very singular special modifications.

Lastly, *Orycteropus* is a form in most respects perfectly apart from all the others. The structure of its teeth alone would almost entitle it to be placed in an order by itself, were it not for the practical inconvenience of doing so. Its vertebral column is formed on the normal type of mammals. Its limbs also present comparatively few specializations; but it resembles the Armadillos in possessing a third trochanter to the femur. Its digestive organs are also comparable to those of the Armadillos, as its mode of feeding is similar. But its reproductive organs, both male and female, and placentation are formed upon a principle unknown in other Edentates, or, in combination, in other mammals. The testes, in a specimen I once examined, were inguinal, though they appear to descend, at all events temporarily, into a scrotum; but the penis is almost as small as in the Great Anteater. The uterus is more bicornuate than in *Manis*, the two lateral chambers opening separately into the vagina, as in some Rodents. The placenta, as described by Prof. Turner, is broadly zonular; but whether deciduate or not is at present undetermined, probably the latter. As Balfour remarks, this type of placenta is capable of being easily derived from that of *Manis*, by the disappearance of the fœtal villi at the two poles of the ovum; while the small size of the umbilical vesicle indicates that it is not, like the zonary placenta of the Carnivora, directly derived from a type with both allantoic and umbilical vascularization of the chorion.

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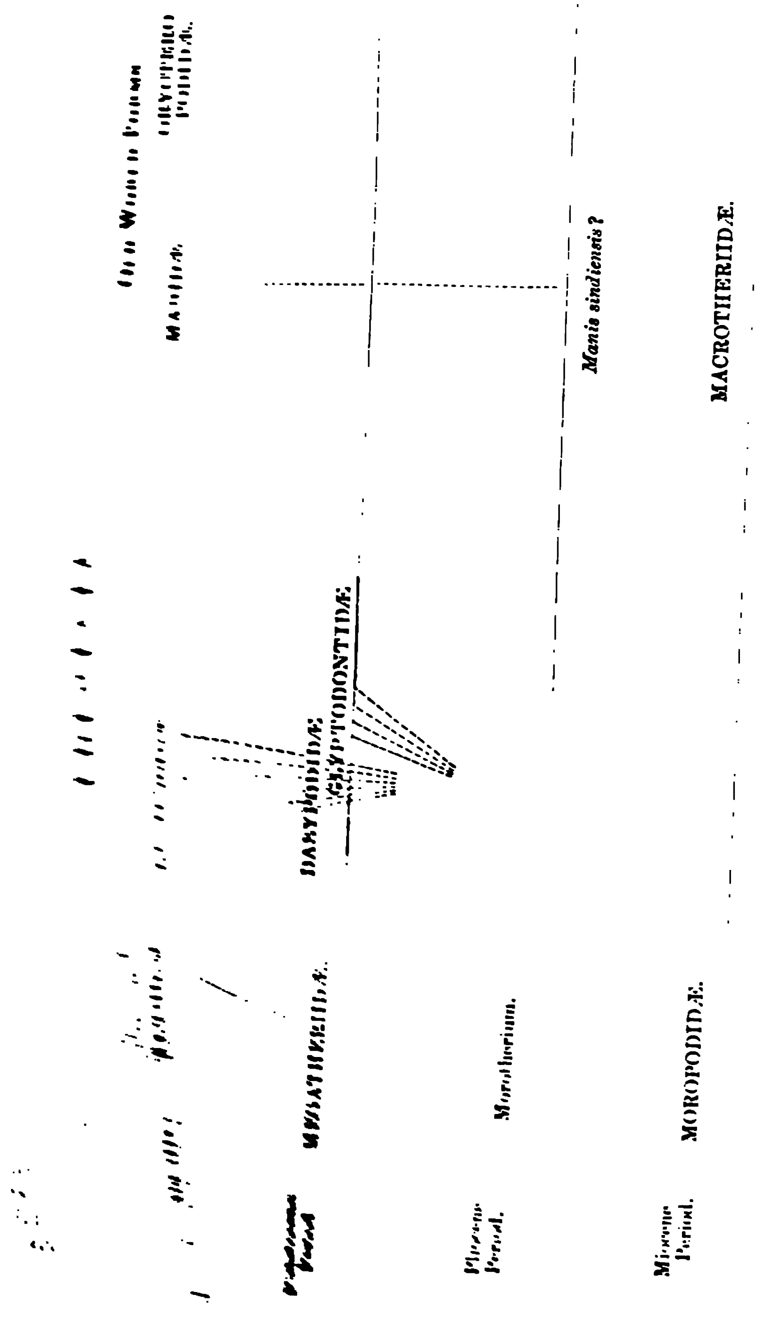
[1] P. Z. S. 1878, p. 677.

Although palæontology has revealed the existence of a vast number of the Edentates by which the New World was tenanted in the Pleistocene age, and has given us a more perfect idea of their characters than is known of most other extinct forms, unfortunately the history of the group throughout the period of the true Tertiaries is at present almost a blank. The presence of a large species probably allied to *Manis* in the Siwalik fauna is indicated by a single phalanx, described and figured by Lydekker under the name of *M. sindiensis*. No animals, attributed with any certainty to the Edentata, are known of Eocene age. The few scattered and imperfect remains of supposed Edentates, *Macrotherium* and *Ancylotherium*, of the European later Miocene formations, and the similarly imperfect and as yet not fully described bones of *Moropus* and *Morotherium* of corresponding ages in North America, indicate that animals existed at that time of large size, presenting characters in some respects allied to the recent members of the order, but in others so different that they cannot be placed in any of the existing families. *Macrotherium*, for instance, appears to have limb-characters which ally it to the Ungulates. As far as can be surmised at present, the affinities of these early forms were rather with the existing members which survive in their own part of the world, than with those of a different hemisphere. *Macrotherium* certainly appears to present more resemblance to *Manis* than to the American Edentates. The first fragments of it which were found were attributed by Cuvier to a "*Pangolin gigantesque.*" But some evidence has since been found in favour of its having possessed teeth. So far this is quite what might be expected; but it certainly throws very little light either upon the mutual relations of the existing forms, the steps by which the present state of things has been brought about, or, what would be still more interesting, their affinities with mammals of other groups. The tabular form (see p. 366) into which the result of these inquiries have been thrown will show what I conceive to be the relationship of the existing forms; but it also shows the great deficiency of our knowledge of the group in past ages.

The general conclusions to which a study of this group have led me may be summed up as follows:—All the American Edentates at present known, however diversified in form and habits, belong to a common stock. The *Bradypodidæ*, *Megatheriidæ*, and *Myrmecophagidæ* are closely allied, the modifications seen in the existing families relating to food and manner of life. The ancestral forms may have been omnivorous, like the present Armadillos, and gradually separated into the purely vegetable and purely animal feeders; from the former are developed the modern Sloths, from the latter the Anteaters. The Armadillos are another modification of the same type, retaining some more generalized characters, as those


Old World Forms
MANIDÆ.
ORYCTEROPODIDÆ.
MEGATHERIIDÆ.
DASYPODIDÆ.
GLYPTODONTIDÆ.
Pliocene Period.
Morotherium.
Manis sindiensis ?
Miocene Period.
MOROPODIDÆ.
MACROTHERIIDÆ.

of the alimentary organs, but in other respects, as their defensive armature, remarkably specialized.

The two Old-World forms *Manidæ* and *Orycteropidæ* are so essentially distinct from all the American families, that it may even be considered doubtful whether they are derived from the same primary branch of mammals, or whether they may not be offsets from some other branch, the remaining members of which have been lost to knowledge.

Alphonse Milne-Edwards, in discussing the inferences to be derived from the study of the fœtal membranes of the Edentates[1], has maintained that one of two views must be accepted:—either that it shows that no value can be attached to the placentation in seeking natural affinities; or that the Edentates as we know them now are not a homogeneous order, but should be separated into several distinct natural groups. It is the latter view to which he gives the preference. It need scarcely be remarked that the observations made in the present communication lead to a similar conclusion.

2. On the Modification of a Race of Syrian Street-Dogs by means of Sexual Selection. By Dr. VAN DYCK. With a Preliminary Notice by CHARLES DARWIN, F.R.S., F.Z.S.

[Received April 4, 1882.]

Most of the naturalists who admit that natural selection has been effective in the formation of species, likewise admit that the weapons of male animals are the result of sexual selection—that is, of the best-armed males obtaining most females and transmitting their masculine superiority to their male offspring. But many naturalists doubt, or deny, that female animals ever exert any choice, so as to select certain males in preference to others. It would, however, be more correct to speak of the females as being excited or attracted in an especial degree by the appearance, voice, &c. of certain males, rather than of deliberately selecting them. I may perhaps be here permitted to say that, after having carefully weighed to the best of my ability the various arguments which have been advanced against the principle of sexual selection, I remain firmly convinced of its truth. It is, however, probable that I may have extended it too far, as, for instance, in the case of the strangely formed horns and mandibles of male Lamellicorn beetles, which have recently been discussed with much knowledge by W. von Reichenau[2], and about which I have always felt some doubts. On the other hand, the explanation of the development of the horns offered by this entomologist does not seem to me at all satisfactory.

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[1] Annales des Sciences Naturelles, Zoologie, 6me série, tome viii. p. 6 (1879).

[2] "Ueber den Ursprung der secundären männlichen Geschlechtscharakteren &c.," Kosmos, Jahrgang v. 1881, p. 172.

In order to ascertain whether female animals ever or often exhibit a decided preference for certain males, I formerly inquired from some of the greatest breeders in England, who had no thoretical views to support and who had ample experience; and I have given their answers, as well as some published statements, in my 'Descent of Man'[1]. The facts there given clearly show that with dogs and other animals the females sometimes prefer in the most decided manner particular males—but that it is very rare that a male will not accept any female, though such cases do occur. The following statement, taken from the 'Voyage of the Vega,'[2] indirectly supports in a striking manner the above conclusion. Nordenskiöld says:—"We had two Scotch collies with us on the 'Vega.' They at first frightened the natives very much with their bark. To the dogs of the Chukches they soon took the same superior standing as the European claims for himself in relation to the savage. The dog was distinctly preferred by the female Chukch canine population, and that too without the fights to which such favour on the part of the fair commonly gives rise. A numerous canine progeny of mixed Scotch-Chukch breed has arisen at Pitlekay. The young dogs had a complete resemblance to their father; and the natives were quite charmed with them."

What the attractions may be which give an advantage to certain males in wooing in the above several cases, whether general appearance, such as colour and form, or vigour and strength, or gestures, voice, or odour, can rarely be even conjectured; but whatever they may be, they would be preserved and augmented in the course of many generations, if the females of the same species or race, inhabiting the same district, retained during successive generations approximately the same general disposition and taste; and this does not seem improbable. Nor is it indispensable that all the females should have exactly the same tastes: one female might be more attracted by some one characteristic in the male, and another female by a different one; and both, if not incompatible, would be gradually acquired by the males. Little as we can judge what are the characteristics which attract the female, yet, in some of the cases recorded by me, it seemed clearly to be colour; in other cases previous familiarity with a particular male; in others exactly the reverse, or novelty. With respect to the first appearance of the peculiarities which are afterwards augmented through sexual selection, this of course depends on the strong tendency in all parts of all organisms to present slight individual differences, and in some organisms to vary in a plain manner. Evidence has also been given in my book on Variation under Domestication showing that male animals are more liable to vary than females; and this would be highly favourable to sexual selection. Manifestly every slight individual difference and each more conspicuous variation depends on definite though unknown causes; and these modifications of structure &c. differ in different species under apparently the same conditions. Statements of this nature have sometimes been misinterpreted, as if it were supposed that variations were indefinite or fluctuating, and that the same variations occurred in all species.

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[1] The Descent of Man, second edit. (1874), part ii. Chap. xvii. pp. 522–525. See also Chap. xiv., on choice in pairing shown by female birds, and on their appreciation of beauty.

[2] 'The Voyage of the Vega,' Eng. translat. (1881), vol. ii. p. 97.

In reference to sexual selection, I will here only add that the complete manner in which the introduced dogs and other domestic animals in South America and other countries have been mongrelized, so that all traces of their original race have been lost, often appeared to me a surprising fact. This holds good according to Rengger[1] with the dogs even in so isolated a country as Paraguay. I formerly attributed this mongrelization merely to the breeds not having been kept separate and to the greater vigour of cross-bred offspring; but if the females often prefer strangers to their old companions, as seems to be the case, according to Nordenskiöld, in Siberia, and in Syria as shown in the following essay, then we can readily understand how rapid and complete would be the progress of mongrelization. I will now give without further comment the essay which Dr. W. Van Dyck, Lecturer on Zoology to the Protestant College at Beyrout, who has had excellent opportunities for observations during a residence of twenty years, has been so kind as to send me.

On the Modification of a Race of Syrian Street-Dogs by means of Sexual Selection. By W. Van Dyck, M.D.

Beyrout is one of the principal ports on the Syrian coast, and has a population of from eighty to one hundred thousand. Like most Oriental cities, its system of street-cleansing is far from perfect, and much of the scavenging is left to the street-dogs, many hundreds of which roam at large through the town and suburbs, picking up a subsistence as they best can. Twenty years ago, and previously, these dogs were quite a homogeneous race, the following being a rough description of a typical specimen :—height at shoulder, 20–22 in.; length from muzzle to root of tail 32–34 in.; length of tail, 12–15 in.; colour sandy grey, with some variety of shades (rarely so light as to pass for dirty white), in most cases distinctly darker above than beneath, and not unfrequently grizzled or brindled; head of medium size, with rather pointed snout and small pointed semipendulous ears; tail bushy, usually carried up over the back, sometimes much curled; general aspect decidedly jackal-like, or semi-wolfish; disposition cowardly, seldom savage. The only departures worthy of mention from the above type, at the time of which I write, were occasional black dogs, mostly with shorter hair than that of the sandy ones, rarely piebald black-and-white specimens. At the present date, the case is very different. The sandy-grey colour still prevails, it is true; but there is hardly an imaginable colour or combination of colours which may not be found; and in form, size, and proportions of trunk and limbs, shape of head, form and size of ears, length and closeness of hair, length, bushiness, and carriage of tail there is nearly as much diversity.

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[1] 'Naturgeschichte der Säugethiere von Paraguay,' 1830, p. 154.

Twenty years ago but few persons in this city owned dogs of any foreign breed whatsoever; but pointers, poodles, terriers, a few greyhounds and setters, and occasionally Newfoundlands, retrievers, and mastiffs have since been imported, and to some extent bred here. By far the majority of foreign dogs to be found in Beyrout at any time are smaller and decidedly weaker than the original natives; very few indeed can range the streets unaccompanied by their masters, without running a considerable risk of more or less serious injury from the street-dogs. Despite their marked muscular inferiority, however, the foreign dogs have succeeded in mongrelizing the whole race of street-dogs so thoroughly that it is now no easy matter to find one of these which does not bear unmistakable evidence of a foreign strain.

To account for this, I can confidently cite the following facts from my own personal observation and experience:—1st. Native bitches very often manifest a decided preference for certain foreign dogs; and I have repeatedly seen such a bitch reject, one after another, a train of kindred suitors, to accept without hesitation a thorough-bred pointer. My brother once owned a French pointer named Jack, quite small, but beautifully proportioned, and of a uniform golden fawn colour. This dog was so great a favourite with the opposite sex of the native breed, that he led an exceedingly "gay" life. Pointer bitches, on the contrary, not unfrequently refused him for the sake of a street-dog. 2nd. Pointers and other well-bred bitches are frequently so decided and persistent in their preference for street-dogs (usually for some particular individual, *unseen* it may be, but communicated with by the voice), that they will go barren whole seasons rather than accept mates chosen for them by their masters. In such cases, a moment's carelessness or inattention is sufficient to ensure a litter of mongrel pups, which, if not destroyed in puppyhood, are very apt eventually to find their way into the street, there to multiply the chance of infection for the whole race. 3rd. Mongrel strains are most strongly pronounced in the suburbs, where street-dogs are rather less numerous than in the heart of the city, and where sly and runaway matches are favoured by hedgerows, shrubbery, &c. &c. In the city itself, on the contrary, where the chances are ten to one that claims will be settled by the law of battle, the foreign taint is not so evident; indeed a casual observer might easily overlook it in many instances; and if any pure-blooded representatives of the old stock are still in existence, it must be in the most thickly stocked quarter, where butcher's shops are many and very near together and street-dogs proportionately numerous.

3. On a small Collection of Mammalia from Central Mexico. By Oldfield Thomas, F.Z.S., British Museum.

[Received April 3, 1882.]

Mr. A. Forrer, one of Messrs. Salvin and Godman's collectors, has recently sent to London a small collection of Mammalia from the State of Durango, Central Mexico; and I have been asked to publish a list of the species contained in it, in order that any additional information to be gained from a collection made in such an interesting locality might be incorporated in the forthcoming Introduction to the Mammalian volume of the 'Biologia Centrali-Americana.' The specimens were all collected either at Ciudad, a village on the Sierra Madre, 8100 feet above the sea, or at Ventanas, another village in the same district, but only 2000 feet in altitude.

It is noteworthy that, of the twelve species in the collection the ranges of which extend beyond Mexico into either North or Central America, just half are Nearctic and half Neotropical, and that, in the case of no less than seven of them, their discovery at Durango adds considerably to their hitherto known ranges. Of these seven, four are Neotropical and were obtained, with the exception of the Raccoon, at the comparatively lowland village of Ventanas, while the other three, of Nearctic origin, were all found at Ciudad, high up in the mountains.

1. VESPERUGO SEROTINUS, var. FUSCUS, Beauv.

Two specimens. Ciudad.

2. NATALUS STRAMINEUS, Gray.

Six specimens. Ventanas.

Not hitherto recorded north of Mirador, Vera Cruz.

From this series it would appear that the bright orange or straw-colour from which the species derives its name, is confined to the adult males, the females being simply pale grey.

3. ARTIBEUS CINEREUS, Gerv.

Two specimens. Ventanas.

This is the most northern locality recorded. There are other specimens from Mexico in the British Museum and elsewhere; but these seem mostly to have been collected in Southern Mexico, and have in no case any exact locality noted.

4. VULPES VIRGINIANUS, Schr.

Two specimens. Ciudad, July 21 and Sept. 30, 1881.

5. PROCYON CANCRIVORUS, Cuv.

One specimen. Ciudad, Sept. 16, 1881.

For remarks on the northern distribution of this species, see Biol. Cent.-Am., Mamm. Supp. p. 208.

6. MEPHITIS MACRURA, Licht.

Two specimens. Ciudad, Sept. 14 and Oct. 1, 1881.

7. **Sciurus aberti**, Woodh.

Two specimens. Ciudad, Aug. 7 and Oct. 14, 1881.

This is the first occurrence recorded of the present species in the region included in the 'Biologia Centrali-Americana.' It has been hitherto only known from Colorado, Arizona, and New Mexico. These specimens, however, exactly agree with the figure given by Dr. Baird of his *S. castanonotus*[1], which Mr. Allen has determined to be a synonym of *S. aberti*[2].

8. **Sciurus griseoflavus**, Gray.

Two specimens. Ciudad, Sept. 19 and Nov. 14, 1881.

9. **Tamias asiaticus**, var. **quadrivittatus**, Rich.

Two specimens. Ciudad, July 6, 1881.

This is the first time that specimens of the genus *Tamias* have been obtained in Mexico. It is true that Mr. Allen[3] has stated his opinion that another species, *T. harrisi*, Aud. and Bach., probably extends into Western Mexico; but the evidence was not sufficient for Mr. Alston to include the genus in the 'Biologia.' It is interesting to observe that it is the bright-coloured variety *quadrivittatus*, and not the pale washed-out var. *dorsalis* of New Mexico, Nevada, and Arizona, that is now found by Mr. Forrer in Durango. This fact is of course confirmatory of Mr. Allen's opinion that *T. dorsalis* is not specifically separable from *T. asiaticus*, since we find the usual northern form reappearing as soon as the desert region inhabited by *T. dorsalis* is past and the country is again fertile and well wooded.

10. **Spermophilus grammurus**, Say.

One specimen. Ciudad, August 20, 1881.

11. **Hesperomys leucopus**, var. **sonoriensis**, LeC.

Two specimens. Ciudad.

[illegible] **Ochetodon mexicanus**, De Sauss.

Two specimens. Ciudad.

[illegible] **Arvicola mexicanus**, De Sauss.

[illegible] specimens. Ciudad.

[illegible] **[illegible]omys talpoides**, Rich.

[illegible] Ciudad, July 24, 1881. The most southern loca[illegible]

[illegible] **[illegible] novemcincta**, Linn.

[illegible] Ventanas, Sept. 14, 1881.

[illegible] **[illegible]urina**, Linn.

[illegible] Ventanas. The most northern locality recorded.

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[1] [illegible] lxv.

[2] [illegible]

[3] Mon. N.-Am. Rod. p. 735, 1877

4. On some Mammals and Birds collected by Mr. J. Hauxwell in Eastern Peru. By Edward Bartlett, Curator of the Maidstone Museum.

[Received March 29, 1882.]

Some time ago I received a collection of mammals and birds from Mr. J. Hauxwell, collected by him in the neighbourhood of Nauta, Elvira, and Loretoyacu, on the banks of the Peruvian Amazons. I regret to say that, my time having been otherwise occupied, I have been prevented from bringing an account of this collection before the Society sooner. However, I think that my notes will be acceptable to those interested in distribution (to which I have already contributed largely), as increasing our knowledge of the avifauna of that vast region.

The collection contained 136 species, 121 of which had been previously obtained during my four years' residence in Peru. But there are 15 species among them not mentioned in my list (which appeared in the 'Proceedings' of the Society for 1873, p. 252); and two of the 15 appear to be new to science, although closely allied to forms already known from the same localities. One belongs to the genus *Thamnophilus*, and the other to the genus *Crypturus*.

It is not my intention to give the names of the 121 species, because they are enumerated in the catalogue above alluded to, but only to refer to those which do not appear in that list.

By the list above referred to I find that the number of species collected by Mr. Bates, Hauxwell, and myself, was 473. I now add 15 species, raising the total to 488.

I here take the opportunity of thanking Mr. Osbert Salvin for his kindness in determining some of the more obscure species, and for pronouncing the two birds new or undetermined.

Mammals.

The three mammals new to the list were as follows:—*Ateles variegata*, Wagner (=*Ateles bartletti*, Gray); *Phyllostoma hastatum* (Pall.); and *Galera barbara*, Retz.,—all from Elvira.

Birds.

1. Henicorhina leucosticta, Cab.

Elvira, E. Peru. "Iris brown."

2. Furnarius leucopus, Sw.

Elvira.

3. Synallaxis hyposticta, Pelz.

Elvira. "Iris white, legs greenish."

4. Nasica longirostris (Licht.).

Elvira. "♂. Iris brown."

5. THAMNOPHILUS LORETOYACUENSIS, sp. nov.

Similis Th. atricapillo, ***sed dorso cinereo nigro mixto, nec brunneo.***
Hab. Loretoyacu. "Iris brown" (*Hauxwell*).

This bird is so closely allied to ***Thamnophilus atricapillus***, that I am somewhat reluctant to give it a specific appellation, although Mr. Salvin writes to me and says "I think the ***Thamnophilus*** sufficiently distinct to be worthy of a name," and Dr. Cabanis also writes:—"Concerning your ***Thamnophilus loretoyacuensis***, I believe it to be a good species. This bird is much larger than ***T. atricapillus***, and has the back and vent cinereous." The bird called *T. atricapillus* (P. Z. S. 1873, p. 273, no. 10), which I obtained on the Upper Ucayali river, is the same as the present species.

6. GRALLARIA MACULARIA, Temm.

Loretoyacu.

A male of this rare species. "Iris yellow."

7. TITYRA SEMIFASCIATA, Spix.

Elvira. "Iris red."

8. GALBULA CHALCOTHORAX, Sclat. Mon. Galbulidæ, pl. x. p. 37, Jan. 1880.

Elvira.

9. PIAYA CAYANA, L.

Elvira. "Iris red."

10. CAPITO NIGER (Müll.).

Loretoyacu. "Iris red."

11. ARA MACAVUANNA, Wagl.

Elvira. "Iris grey; naked skin round the eye yellow."

12. HYPOTRIORCHIS RUFIGULARIS (Daud.).

Nauta. "Iris brown."

A single skin of this bird was in the collection; and I am now convinced that many of the small Falcons observed by me during my residence in Nauta were referable to this species, although I could not obtain a single specimen: they were so wild and difficult to approach.

13. GLAUCIDIUM PHALÆNOIDES (Vieill.).

Loretoyacu. "♀. Iris bright yellow."

14. TRINGOIDES HYPOLEUCOS, L.

Elvira. "Iris brown."

15. CRYPTURUS BALSTONI, sp. nov.

Species similis C. asperso, *sed ventre cinereo et lateribus dorso concoloribus distinguenda.*
Hab. Elvira. "♂. Iris light brown" (*Hauxwell*).

Although this species is so closely connected with *C. aspersus* and *C. vermiculatus*, I think it deserves to be separated from them at present. Dr. Cabanis, when answering my questions respecting this species, says:—"Your *Crypturus* is not very different from *C. adspersus*, Licht. (which I consider identical with *C. vermiculatus*, Temm., Wagl.). The chief differences are that the vent is not whitish, but cinereous, and the flanks brownish like the back, not light ferruginous. I would consider your bird as the Peruvian form of the Brazilian *C. aspersus*."

I have named this bird after Mr. R. J. Balston.

I may here mention that *Crypturus bartletti*, Scl. et Salv. (Proc. Zool. Soc. 1873, p. 311), was obtained at Santa Cruz on the Huallaga river, E. Peru, not at Santa Cruz de la Sierra, as there stated in error.

5. A Contribution to the Molluscan Fauna of Madagascar.

By Edgar A. Smith.

[Received April 12, 1882.]

(Plates XXI. & XXII.)

Much still remains to be done before our knowledge of the terrestrial and fluviatile Mollusca of Madagascar will attain any thing like completeness. With the exception of *Achatina fulica*, *Helix magnifica*, and one or two others, I am not aware that the animals of any of the numerous species of shells already described from this island have been examined. Of non-operculate land-shells about eighty are now known, of operculate species about seventy-five, and about fifty forms have been recorded from the lakes and rivers; this computation includes the new species about to be described, and a few hereafter mentioned for the first time as inhabitants of Madagascar, which were originally described without localities. One minute species, *Helix barrakporensis*, has not previously been met with except in India, where it may have been introduced, as is the case with the large *Achatina fulica*, a most abundant shell in some parts of Madagascar and also at the Mauritius. A small South-African bivalve shell, *Limosina ferruginea*, is now cited for the first time as an inhabitant of the island; and *Sphærium madagascariense* of Tristram is scarcely separable from another African species, *S. capense* of Krauss. Four species belonging to genera not previously known from Madagascar are now described; these are *Vitrina madagascariensis*, *Cleopatra trabonjiensis*, *Corbicula madagascariensis*, and *Pisidium johnsoni*.

Part of the collection which is here reported upon was liberally presented to the British Museum by Mr. W. Johnson, who has recently returned to England, and to whom much praise is due for so carefully noting the precise localities where he collected the various species; and on this account his name will be found associated with several of his own interesting discoveries. The remaining portion was obtained from the Rev. W. Deans Cowan, and was collected by him in a more southern part of the island than that visited by Mr. Johnson. It also contains several very interesting forms, notably the species of *Vitrina* previously referred to, and the *Bulimus nigrilineatus* of Reeve, belonging to a section (*Rhachis*) of that immense group of land-snails which was hitherto unknown in Madagascar.

A. GASTROPODA.

CYCLOSTOMA MACAREÆ, var.

Hab. Betsileo (*Cowan*).

The typical form of this species, described by Petit, was originally collected in the south part of Madagascar, near Saint Augustin. The more northern variety from Betsileo is rather more coarsely sculptured, and has a distinct peripherical black zone, and sometimes a broader but less distinct one on the upper part of the last whorl.

CYCLOSTOMA BETSILEOENSE, sp. nov. (Plate XXI. fig. 2.)

Shell umbilicated, turbinate-globose, thinnish, finely spirally lirate, encircled with two more prominent white keels, one at the middle of the body-whorl, and the other above, decussated by close lines of growth; cinereous (except the reddish spire), copiously striped longitudinally with a brownish colour, with a few spiral purple-black lines and zones, one just beneath the central white carina, broader than the rest, and a rosy stripe outside the labrum. Whorls 5½, separated by a narrowly channelled suture, which is beautifully clathrated by the lines of growth. Two nuclear whorls smooth, convex, forming an obtuse apex; the rest convex, but appearing a little angular at or a little above the middle, where the upper carina is situated. The visible spiral threads are six in number on the antepenultimate whorl, about twelve on the penultimate (including the two white keels), and nearly double the latter number upon the upper half of the body-whorl, the lower part having as many as thirty-two to thirty-five, those around the umbilicus being a trifle coarser than the rest, the interstices being everywhere decussated by the lines of growth. The spiral lineation is constant in three out of five examples, is chiefly confined to the last whorl, and is most conspicuous within the aperture when the shell is held up to the light. There are two lines above the upper white keel, two between it and the lower one, and about six beneath the latter, the uppermost being much broader than the rest. Aperture subcircular, chestnut within, very dark towards the outer lip, showing the external lines and bands, a little higher than wide. Peristome acute, white on the columellar margin, only narrowly reflexed, flatly and more widely expanded on the right or outer margin, pink, except at the upper part towards the suture.

Greatest diameter 25 millim., height 25.

Hab. Betsileo (*Cowan*).

In some respects *C. pulchellum* of Sowerby approaches this species.

The peristome is very similar; and the sculpture is somewhat of the same character. Still there are differences of form, of colour, in the sutures, and in the size of the aperture, which readily distinguish these forms, which no doubt inhabit different districts of the island.

Var. *a*.

Shell with a less elevated spire, shorter and broader whorls, more widely umbilicated, with a larger and more oblique mouth, and the outer lip not stained with rose.

Greatest diam. 30 millim., height 24.

Hab. Betsileo (*Cowan*).

Var. *b* (Plate XXI. fig. 3).

Shell a trifle more ventricose than var. *a*, with the umbilicus similar to that of the type, but the aperture larger and the peristome white, with the body-whorl smoother, with fewer and subobsolete spiral liræ, except within and around the umbilicus.

Greatest diam. 30 millim., height 26½.

Hab. Betsileo (*Cowan*).

CYCLOSTOMA CONGENER, sp. nov. (Plate XXI. fig. 1.)

Shell openly umbilicated, subdepressedly turbinate, rather smooth, obsoletely spirally sulcate, striated with lines of growth which are puckered and distinct at the sutures; bright yellow, longitudinally streaked with a darker tint, dark cinereous behind the white expanded lip, encircled at the periphery by a vivid purple-brown band and with two or three hair-like lines of a paler colour, both above and below the middle. Spire elevated, conical, ending in a bluish obtuse tip. Whorls 5½, very convex; the last large, strongly lirate around and within the umbilicus, where it is stained with purple-brown. Aperture large, oblique, ovate-subcircular, light brown within except near the lip, where it becomes of a very dark chestnut-brown or nearly black, this colour extending along the inside of the columellar edge. External band and lines visible within. Peristome roundly expanded and reflexed, white, broad on the dextral margin, narrower on the columellar side.

Greatest diam. 34 millim., height 30.

Hab. Tanala province (*Cowan*).

This form approaches most closely to *C. consanguineum* of Sowerby (= *C. obsoletum* of Reeve, not of Lamarck), but may be distinguished by its greater size, its yellow colour, dark apex, and rather more elevated spire. Both species have the same disposition of the spiral bands and lines—namely a single central broad zone, two narrower ones between it and the suture, which are visible on the spire, and two others beneath it and around the lower surface of the whorl. In some specimens of *C. consanguineum* some of the sulci around the umbilicus are also of a dark colour. On holding up a specimen of *C. congener* to the light, three lines above and three below the broad band are generally observable. *C. obsoletum* of Lamarck, according to Delessert's figure (Recueil, pl. 29. f. 11*a*) has five or six lines on the penultimate whorl, and is a more elevated shell than *C. consanguineum* (= *obsoletum*, Rve.), in both these respects agreeing very well with *C. madagascariense* of Gray, which I consider almost identical with, or at most only a slight variety of, *C. unicarinatum* of Lamarck (non *C. unicarinatum* of Sowerby, Pfeiffer, and Reeve, = *C. fulvifrons*, Sowerby).

CYCLOSTOMA JOHNSONI, sp. nov. (Plate XXI. figs. 4, 5.)

Shell small but thickish; white, with a single purple-brown zone a little below the middle of the body-whorl; openly umbilicated, finely lirate upon the spire, smoother upon the last volution, especially on the lower surface, striated by lines of growth. Whorls 5, convex, separated by a deep suture, first two smooth, the third with about five fine spiral liræ, the penultimate with about eight rather finer ones, increasing in number but much more feebly developed upon the upper half of the last whorl, and quite obsolete beneath the periphery, and scarcely traceable within the umbilicus. Aperture a trifle oblique, subcircular, a little longer than wide, white, with the single band. Peristome continuous, expanded all round, rather more so on the columellar side than on the opposite margin.

Greatest diameter 14 millim., height 13½; aperture 8 long, 6⅔ wide.

Hab. South of Trabonjy, north-west central part of Madagascar (*Johnson*).

This very interesting species is not likely to be confounded with any previously described; and I have much pleasure in associating with it the name of its discoverer. It is a comparatively smooth shell, characterized by the simplicity of its coloration and the non-lirate lower surface of the body-whorl.

CYCLOSTOMA LINEATUM, Pfeiffer.

Cyclostoma lineatum, Pfeiffer, Conch. Cab. pl. 45. f. 3, 4; Smith, P. Z. S. 1881, p. 278 (as var. of *C. insulare*, Pfr.).

Hab. Valley of Marohogo near Mojonga, north-west Madagascar (*Johnson*).

The specimen from the above locality is exactly similar in all respects to the type of this species, which at one time I considered a variety of *C. insulare*. As the localities prove to be different, I now think it better to keep the two forms separate. Some small varieties of *C. insulare* from the country between Lake Nyassa and the east coast of Africa, referred to by me in the 'Proceedings,' approach very closely the present species. None of them, however, are absolutely identical, the umbilicus being a little more contracted, the spire a trifle lower, and the liration around and within the umbilicus decidedly coarser. In *C. lineatum* this is unusually fine. Pfeiffer described the shell as smooth; but this is not correct. To the unaided eye such appears to be the case; but on making use of a lens, the fine brown lines are seen to be elevated (*liræ*), and the lines of growth are by no means inconspicuous. The spiral lines number about twelve on the penultimate whorl, alternately fine and still finer. *C. sarcodes*, Pfr., is still higher in the spire, with higher volutions, and more strongly lirate, especially on the lower surface of the last whorl.

VITRINA MADAGASCARIENSIS, sp. nov. (Plate XXI. figs. 6, 7.)

Shell ventricose, depressed, very thin, diaphanous; pale greenish yellow, with a brown line at the suture, and with the upper part of the outer lip of the same colour, brilliantly glossy. Spire small, a little elevated and obtuse at the apex. Whorls 3½, convex, deep, and margined above at the suture; the first 1½ microscopically decussated in a beautiful manner by minute spiral striæ and very fine lines of growth, the last two lacking the spiral striæ. Body-whorl large, with distinct, here and there subplicate, lines of growth, on the lower surface exhibiting indications of interrupted concentric striæ. Aperture subhorizontal, large. Columella arcuate, thin, wrinkled, as is also the base of the peristome.

Greatest diam. 15½ millim., smaller 12, height 9.

Hab. Betsileo (*Cowan*).

This I believe is the only species of *Vitrina* at present known from Madagascar; and it bears some resemblance to certain forms of the genus from South Africa.

HELIX (NANINA?) BALSTONI, Angas.

H. balstoni, Angas, Proc. Zool. Soc. 1877, p. 528, pl. 54. f. 5.

Hab. Interior of Madagascar (*Angas*); forest 36 miles east of Antananarivo (*Johnson*).

The specimen presented to the British Museum by Mr. Johnson is narrowly perforated, in which respect alone it differs from the description of this species given by Angas. Two other shells in the Museum are also narrowly perforate; and even the above-quoted figure looks as if the example delineated were likewise umbilicate; so that it is possible the species was described as "imperforate" accidentally.

HELIX (NANINA?) CLEAMESI, sp. nov. (Plate XXI. figs. 8, 9.)

Shell very thin, semitransparent, vinous horn-colour, narrowly perforate, suborbiculately conical, keeled at the periphery, marked with curved lines of growth crossed and rendered minutely granular on the spire by fine concentric striæ, more finely concentrically striated on the under surface, more glossy and not granulated. Spire with slightly convex outlines, shortly conical, ending in an obtuse tip. Whorls 6, a little convex, regularly increasing, a little depressed near the lower submarginal suture, or, in other words, just above their periphery. Last volution keeled above the middle, the carina being less marked near the outer lip. Base convex. Aperture somewhat oblique, lunate. Outer lip obliquely arcuate above the feeble carination, straightish or even a little sinuated below it in a very slanting or receding direction. Columella narrowly expanded and reflexed over the perforation, forming below, with the basal edge, a regular wide curve.

Greatest width 26 millim., height 17.

Hab. Ankafana, Betsileo province (*Cowan*).

There is only one other Madagascar *Helix* which is likely to be confounded with this species, namely *H. balstoni* of Angas. The latter has the whole surface minutely sculptured with raised *criss-cross striæ* in addition to the lines of growth. It is also more acutely carinate, has a less convex spire, and the body-whorl is considerably smaller and less inflated below the periphery. In *H. cleamesi* the sculpture consists of *concentric striæ* crossing the lines of increase and rendering them beautifully granular on the upper surface.

HELIX (KALIELLA) BARRAKPORENSIS, Pfeiffer.

Helix (*Kaliella*) *barrakporensis*, Pfeiffer, Conch. Cab. pl. 147, f. 20–22; Reeve, Con. Ic. f. 816; Hanley, Conch. Indica, pl. 87. f. 7.

Hab. About 30 miles east of Antananarivo (*Johnson*).

On comparing the three specimens of this species from the above locality with a series from Simla in India, presented to the British Museum by Capt. T. Hutton, and also with the types described by Pfeiffer, I am unable to find any distinction, and consequently conclude that this species (like *Achatina fulica*) has been introduced into India.

HELIX (HELICOPHANTA) BICINGULATA, sp. nov. (Plate XXI. figs. 13, 14.)

Helix cornu-giganteum, Angas (non Chemnitz), Proc. Zool. Soc. 1877, p. 527.

H. guestieriana, Angas (non Crosse), op. cit. 1878, p. 312.

Shell large, ovate, ventricose, imperforate or narrowly rimate; light olive-brown above, darker brown towards the lip, with the lower surface beneath the periphery still deeper in tint, encircled by two dark-brown slightly raised narrow bands, one at the periphery, the other and more distinct one above it. Spire depressed, convex, only a little raised above the body-whorl. Volutions 4, very rapidly increasing, convex, separated by a deepish suture; two upper ones striated by simple arcuate lines of growth; the third coarsely granular, the lines of growth being but feebly expressed; the last very large, much descending in front, granular at its commencement, the granules gradually disappearing and replaced by close, oblique, short indentations, also exhibiting five or six *nearly obsolete* concentric ridges above the upper brown zone, and two or three between it and the lower one, the lines of increase being more distinct upon this than the preceding whorl. Lower surface swollen around the umbilical region, marked with arcuate lines of growth, and oblique, close, short indentations like the upper surface, rounded at the periphery. Aperture obliquely elongate, bluish lilac within. Lip whitish, expanded, reflexed. Columella thickened, *arched forward* a trifle just beneath the umbilicus, *very granular*, expanded and reflexed over the perforation, sometimes not quite closing it, united to the outer lip by a very thin granulated callosity, coating the whorl within the aperture.

Greatest diameter 76 millim., smallest 58, height (resting on its base) 35.

Hab. Ekongo, South-east Madagascar (*Waters*).

This is the species erroneously considered by Mr. Angas to be the *H. guestieriana* of Crosse, which much more closely resembles *H. ibaraoensis* of the former author. *H. guestieriana* is a more globose shell, with a higher penultimate whorl, a shorter aperture, a smooth columella, and a smooth callosity upon the body-whorl, which is encircled by several slightly raised ridges of more equal size than in *H. bicingulata.* The granular and slightly arched-forward columella in the latter species, the obliquely indented surface of the body-whorl, and the two very conspicuous brown slightly raised girdles around it, the lower one bordered by an indistinct pale one above, distinguish this from the allied forms, *H. cornu-giganteum, H. betsileoensis, H. ibaraoensis,* and *H. guestieriana.* The first two are openly umbilicated, the third generally imperforate (in about fifty specimens I have seen a few with a narrow perforation); and the last is said to be "narrowly subrimate." *H. betsileoensis* has the columella granular as in the present species; in the other three it is smooth. In *H. ibaraoensis* the callus uniting the columella and the outer lip and spreading over the whorl within the aperture is conspicuously granulated, and the epidermis is nearly black towards the lip.

All the five species here remarked upon are, no doubt, offshoots from one original progenitor; still I have found no difficulty in recognizing any specimen which has yet been examined. Probably no two exist in precisely the same locality. The following is the distribution as at present known:—

H. cornu-giganteum.

Hab. Island of Agalega, N.E. of Madagascar (*teste* Sir David Barclay !).

H. guestieriana.

Hab. Madagascar (no precise locality known).

H. betsileoensis.

Hab. S.E. Betsileo (*Angas*); Tanala country (*Deans Cowan*).

H. ibaraoensis.

Hab. S.E. Betsileo (*Angas*); Tanala country (*Deans Cowan*).

H. bicingulata.

Hab. Ekongo, south-east of the island (*Waters*).

HELIX (MACROCYCLIS?) COVANI, Smith. (Plate XXI. figs. 10–12.)

Helix (*Macrocyclis*?) *covani*, Smith, Journ. of Conch. vol. ii. p. 338.

Hab. Ankafana, Betsileo province (*Cowan*).

This species was originally described from a single specimen which did not illustrate the full size attained by adult shells. The largest and apparently full-grown example recently brought to England by Mr. Cowan has a greatest diameter of 45 millim., is 34 across at the smallest diameter, and 20 high, resting upon its base. The peristome is not thickened or expanded on the upper margin, but is simple and arcuate.

HELIX (AMPELITA) SHAVI, Smith. (Plate XXII. figs. 1–3.)

Helix (*Ampelita*) *shavi*, Smith, Journ. of Conch. 1879, vol. ii. p. 339.

Hab. Tanala province (*Cowan*).

In this instance also, as with *H. covani*, the dimensions given in the above work are not those attained at times by this species. The largest before me is 35 millim. across the greatest width, and 28 at the smallest. All retain the character of the last whorl descending in front, and have the labrum more or less (sometimes entirely) violet-brown.

HELIX (AMPELITA) PERCYANA, Smith.

Helix (*Ampelita*) *percyana*, Smith, Proc. Zool. Soc. 1880, p. 485, pl. 48. f. 12, 12*a*.

Hab. Ankafana, Betsileo (*Cowan*).

Of this species, originally described from a unique specimen in Dr. Percy's collection, I have now seen four more, very similar to the type, and differing from one another only in the disposition and quantity of the remarkable opaque creamy-yellow zigzag markings. Sometimes the expanded outer lip is of a livid purple colour.

BULIMUS (RHACHIS) NIGRILINEATUS, Reeve. (Plate XXII. fig. 4.)

Hab. Betsileo (*Cowan*) ; ——? (*Reeve*).

The type of this species, described by Reeve (Conch. Icon. pl. 77. fig. 567), is of immature growth. The name is not a characteristic one; for the lines are not black, but of a bronzy brown colour. Their disposition and number appear tolerably constant. There are two around the middle of the last whorl, of which the upper is a trifle the broader; a third is situated above these, intermediate between them and the suture; a fourth encircles the base; and at times two or three finer ones are met with in the same part; and in the immediate region of the columella the shell is horny and pellucid, contrasting conspicuously with the rest of the opaque yellow surface. The whorls are seven in number, rather convex, sculptured with lines of growth and microscopical spiral striæ. The apex is brownish horn-colour and not very acute. The columella is perpendicular and rather straight, narrowly reflexed above, thus forming a slight rimation.

STENOGYRA (CLAVATOR) JOHNSONI, sp. nov. (Plate XXII. fig. 5.)

Shell moderately thick, imperforate, elongate, subcylindrical, slightly shining; rich brown, with darker streaks here and there, paler towards the apex, where the epidermis is mostly worn off, leaving a white surface; last whorl indistinctly transversely zoned and lineated with dark brown. Volutions 7, rather convex, regularly increasing, longitudinally striated by the lines of growth, which are more or less puckered beneath the suture, and at times somewhat wrinkled through being crossed by a few obsolete transverse striæ. The extreme upper edge of the whorls is yellow at the suture. Body-whorl scarcely descending in front. Aperture inversely auriform, blue within, occupying three eighths of the entire length of the shell. Outer lip thickened within, dirty whitish. Inner lip of the same colour, thickened also, narrowly expanded in the umbilical region, joined to the labrum above by a thin callus.

Length 53 millim., width 21; aperture 20 long, 11½ broad.

Hab. Near the river Anonive, about fifty miles south of the capital, Antananarivo (*W. Johnson*).

This species might be regarded by some as a dwarf form of *S. eximia*, Shuttleworth; but, besides size, there are other distinctions. Mr. Johnson says he never could find the larger species at the above locality, nor did he ever meet with the smaller one in company with it elsewhere. As the last whorl in the present species scarcely descends at all, the suture is less oblique than in *S. eximia*; the surface is less puckered by transverse striæ, the breadth of the shell is greater in proportion to its length, the last whorl is less cylindrical, the columella is not so broadly reflexed or flattened in front, and the aperture is narrower at the base.

MELANATRIA JOHNSONI, sp. nov. (Plate XXII. figs. 6, 7.)

Shell large, elongate-pyramidal, turreted, thick, covered with an olive epidermis, closely lineated or strigate with longitudinal lines of a darker tint. Whorls — ?, the remaining nine excavated at the upper part, very slightly convex beneath, strongly spirally ribbed and grooved. The ribs are six in number on the upper whorls and rounded; the two above are much more slender than the four beneath; the uppermost borders the suture; the next lies in the concavity at the top of the whorls; and the rest surround the slight convexity, and are three times as broad as the sulci separating them. All the whorls, with the exception of the last four, are coronated at the slight angle below the excavation with very short, hollow, oblique spinules; and some of the spiral grooves exhibit rows of fine granules. The last whorl descends somewhat, giving the shell a slightly distorted appearance; it is girded with about twelve transverse costæ, a few at the base being smaller than five principal ones around the middle. The aperture is bluish within, faintly stained with olive-brown near the margins. Peristome widely and deeply sinuated on the outer lip in the concavity of the whorl, arcuate and prominent in the middle, then shallowly sinuated again (*vide* fig. 7). Columellar margin thickened, free, arcuate, reflexed, ending in a distinct basal sinus.

Length 78 millim., diam. 24; aperture 24 across diagonally, and 16 in a transverse direction.

Hab. River Kamony, in the north-west of the island (*W. Johnson*).

This very striking shell is not uncommon in the above locality; and it is surprising that so large a species has not been brought to Europe before. It cannot be confounded with any of the other forms of *Melanatria*, being so remarkable on account of the very strong spiral ridges. Like many freshwater shells, this is also generally coated with a black earthy deposit.

Cleopatra trabonjiensis, sp. nov. (Plate XXII. figs. 10, 11.)

Shell narrowly umbilicated, turbinate, thinnish, yellowish olive, with several transverse black lines and zones. Apex worn away. Remaining volutions 3½, convex, bicarinate. Keels black; the upper one situated rather above the middle of the whorls, giving them a tabulated appearance, the lower one close to the suture; these keels are more or less obsolete on the body-whorl, especially near the lip. In addition the lower part of this volution is finely concentrically lirate, the ridges being rugose in consequence of being crossed by the lines of increment, which are rather conspicuous, and at times puckered at the carinæ. The entire surface is also microscopically striated in a spiral direction. Aperture roundly ovate, showing the external coloration. Lip thin. Columellar margin a little expanded and reflexed, whitish, joined above to the extremity of the outer lip by a very thin callosity. Operculum very concave exteriorly, brown; nucleus paucispiral, situated about halfway between the centre and the columellar edge.

Length 12 millim., diam. 7; aperture 6 long, 4½ wide.

Hab. A small lake at Trabonjy, in the north-west central part of the island (*Johnson*).

The carination of the volutions, the minute spiral striation, the thinness of the shell, its umbilicus, and other features distinguish this species from *Paludomus madagascariensis* of Brot. In addition to the two dark keels, the upper part of the whorls has a broad zone at the suture, and the body-whorl has a similar band around the base in addition to one or two narrower ones above.

Ampullaria madagascariensis, sp. nov. (Plate XXII. figs. 3, 4.)

Shell subglobose, narrowly umbilicated, moderately thick, sculptured with lines of growth and more or less distinct microscopic spiral striæ; greenish olive, with numerous purple-brown transverse lines and zones. Whorls 6, flattened and broadly excavated above, convex at the sides, divided by a deep, pale sutural line; the last [illegible] in front, the aperture being towards the eye. First three whorls generally eroded and purple-black; when perfect, in young shells, very distinctly spirally striated. Aperture ovate-pyriform, [illegible] within, yellowish on the columella and towards the [illegible] [illegible], the spiral lines and zones are particularly vivid. Peristome [illegible], the columellar margin being well curved and a little reflexed, [illegible] with the termination of the outer lip by a very thin [illegible] deposit of callus, before the deposition of which the starting-point of the columella is conspicuously defined by a transverse white line, which starts just above the umbilicus and winds round the penultimate whorl within the aperture. Operculum generally dirty lilac on the inside, but sometimes white or horny-brown.

Height 50 millim.; greatest diam. 49, smallest 38; aperture 36 long, 23 wide.

Hab. In a marsh, north of Antananarivo (*Johnson*); Imerina province (*Cowan*).

In form this species is not unlike *A. largillierti* of Philippi, but it is quite distinct in several respects. The spiral striation is finer, the umbilicus broader; the aperture is not angular or effuse at the base, nor has the last whorl the rounded keel or ridge at the base around the umbilical fissure.

A. cecillei, Phil., appears to be more ovate, with less tabulated whorls, has a higher spire, and is differently coloured.

It is only in adult specimens that the commencement of the aperture near the lip is yellow. The columella is also of that colour in full-grown shells, but bluish white in young ones. This species appears to arrive at maturity after two years' growth, as all the large specimens exhibit a dark longitudinal stripe or former lip just before the completion of the fifth whorl. In the young state this is very thin, and the colour is horny-brown, and not greenish olive like the last large whorl of the adult.

LIMNÆA HOVARUM, Tristram.

Limnæa hovarum, Tristram, Proc. Zool. Soc. 1863, p. 61.

Hab. Ankafana, Betsileo (*Cowan*).

This species grows to a larger size than that of the specimen described by Tristram; for one from the above locality is as much as ten lines long. In the larger shells the lines of growth become more prominent, forming arcuate and tortuous elevated ridges. The columella also is reflexed, appressed to the whorl, yet leaves a slight chink or rimation in the umbilical region. All the specimens examined exhibit traces of transverse or spiral striæ, generally interrupted and of a subpunctate character.

LIMNÆA ELECTA, sp. nov. (Plate XXII. figs. 12, 13.)

Shell small, ovate, transparent, corneous, narrowly rimate. Whorls 3–3½, convex, rapidly increasing. Spire small, obtuse and reddish at the apex. Last whorl elongate, sculptured with fine lines of growth crossed by a few spiral striæ. Aperture vertical, ovate, acuminate above, occupying about two thirds of the entire length of the shell. Columella rather high up, reflexed over the umbilical fissure, the reflexed portion being striated rather coarsely lengthwise.

Length 6½ millim., diam. 4; aperture 4½ long, 2⅔ wide.

Hab. About 20 miles from Antananarivo (*Johnson*).

This little species has much of the general aspect of the genus *Succinea*, and is peculiar on that account and the red tip of the spire.

Physa madagascariensis, Angas. (Plate XXII. figs. 18, 19.)

Physa madagascariensis, Angas, Proc. Zool. Soc. 1877, p. 528, pl. 54. figs. 2*a*, 2*b*.

Hab. Ekongo, S.E. Madagascar (*Waters*); Betsileo (*Cowan*).

The type figured in the 'Proceedings' is larger than any of the specimens from Betsileo, and rather broader and more globose than most of them; but all agree in the peculiar conspicuous longitudinal subliration or plication which adorns the surface. The suture is deep and channelled, and filled up by the upper terminations of the plicæ, which form fine erect lamellæ. *P. lirata* of Tristram has a depressed spire and even stronger liræ than the present species, in which the spire is at times considerably higher than in the shell depicted by Angas.

Physa lamellata, sp. nov. (Plate XXII. figs. 14, 15.)

Shell very fragile, rimate, ovate, not very glossy, olivaceous horn-colour, longitudinally coarsely lamellato-lirate. Whorls 3–4, convex, separated by a deeply channelled suture, the last descending, not square-shouldered above. Aperture occupying a little more than three fourths of the entire length of the shell. Columella but little contorted, reflexed, joined to the lip above by a thin corneous callosity, more or less striated lengthwise.

Length 12 millim., diam. 9; aperture 9 long, 5 wide.

Hab. Twenty miles from Antananarivo (*Johnson*).

This may be but a variety of *P. lirata* of Tristram, of which there is a single specimen in the British Museum obtained from the collection of the late Henry Adams. It is chiefly distinguished by the difference in its form, the greater coarseness of the liræ, which have a thin lamellar epidermis attached to them. The last whorl descends near the aperture, and is not so squarely shouldered as *P. lirata.*

Physa obtusispira, sp. nov. (Plate XXII. figs. 16, 17.)

Shell small, transparent, light horn-colour, narrowly rimate, somewhat glossy, indistinctly spirally striated, longitudinally plicately ridged, very regularly and strongly upon the spire and upper part of the body-whorl near the suture, the liræ on the lower part becoming subevanescent. Volutions 3½–4, very convex, rapidly increasing, separated by a deeply channelled suture. Spire very short, only a little raised above the last whorl. The latter descends in front, is large, and rounded at the shoulder above. Aperture inversely subauriform, and occupying about four fifths of the entire length of the shell. Columella very slightly twisted, narrowly reflexed over the umbilical fissure, connected with the lip above by a thin callus upon the whorl, which sometimes exhibits a few *white* lines upon it, disposed lengthwise.

Length 10 millim., greatest diam. 8; aperture 8 long, 4½ wide.

Hab. About 20 miles from Antananarivo (*Johnson*); Betsileo (*Cowan*).

This, like all the known species of *Physa* from Madagascar, is strongly lirated for this genus. It is a smaller form than *P. madagascariensis*, has a shorter and more obtuse spire, a narrower perforation and spiral striation. *P. lirata* is more strongly lirate than it, has the spire even still shorter, the body-whorl is prominently shouldered above, and the aperture is longer in proportion.

PLANORBIS MADAGASCARIENSIS, sp. nov. (Plate XXII. figs. 20–22.)

Shell moderately thick, deeply excavated both above and below, corneous brown, rather strongly striated by the lines of growth, and *sometimes* exhibiting traces of spiral striation. Whorls 4–4½, rapidly increasing; the last large, rather high, convex, rather deeply incurved at the suture both on the upper and underside, finely malleated, chiefly round the middle. Aperture largish, broadly lunate, raised above or on a level with the penultimate whorl. Peristome thin, receding at the base, its extremities connected by a very thin deposit of callus on the whorl.

Greatest diam. 12⅓ millim., smallest 10, height 4¾.

Hab. Lake Itasy (*Johnson*).

This species is very like *P. pfeifferi*, Krauss (Sudafr. Moll. pl. v. f. 7), but may be distinguished by the malleation of the last whorl, its greater height, and browner colour.

NERITINA GAGATES, Lamarck.

Neritina gagates, Lamarck (*vide* Martens, Conch. Cab. p. 94).

Hab. Tamatave (*Cowan*).

Two specimens from the above locality I believe to belong to this species, differing only in the deep red colour of the columellar callosity, and the olive-green tint of the outer lip. The form is the same; and the denticles on the columella, the painting, the microscopic spiral sculpture, and the operculum are all similar.

NERITINA FULGETRUM, Reeve. (Plate XXII. figs. 23, 24.)

Neritina fulgetrum, Reeve, Conch. Icon. pl. 23. f. 103 *a*, sp. 103.

Hab. ——? (*Reeve*); south of Tamatave (*Johnson*).

This species has hitherto been represented by a single specimen without any locality in the Cumingian collection, now in the British Museum. As the description in the 'Conchologia Iconica' is very short and incomplete, I will here add a few further details. The black zigzag lineolation at times is very close, thus giving the shell a greyish appearance when viewed at a distance; and a character not referred to by Reeve, but indicated in his figure, is the brown margin to the body-whorl at the suture, beneath which the volution is faintly constricted. The columellar callosity is much thickened and of a red colour, and extends some distance over the whorl. The edge of the columella is pale, straight, with a shallow sinus a little below the middle, furnished with about a dozen denticles. The aperture is rather small, bright yellow far within, then whitish, and again yellow or greenish-yellow at the lip. The operculum is slaty black exteriorly, with the arcuate margin red, and reddish on the inner surface, with two pale rays from the nucleus, one central and the other submarginal, the extreme edge being blackish. In all these respects it coincides with that of *N. gagates*, Lamarck, from the Mauritius; and the terminal processes are similar in both forms. Von Martens's conjecture that the species might belong to *N. retifera*, Benson (Conch. Cab. p. 283), is not to be wondered at, considering the briefness of Reeve's description, and the fact of only the back of the shell being figured.

B. CONCHIFERA.

CORBICULA MADAGASCARIENSIS, sp. nov. (Plate XXII. figs. 25–27.)

Shell a little inequilateral, rounded and narrow in front, much broader, squarish, and subtruncate posteriorly, arcuate along the ventral margin, finely concentrically striated; yellowish, greenish down the posterior side. Umbones a little prominent, incurved, situated a little anteriorly. Interior lilac, with two or three rather distant concentric purple zones, stained with dark purple down the posterior side, and with a smaller stain of the same colour at the anterior side.

Length 11½ millim., width 14, diameter 7.

Hab. Twenty miles from Antananarivo (*Johnson*).

The concentric striæ are deep and regular upon the umbones; but towards the ventral margin they become less regular and finer, and in front are rather more strongly developed than towards the posterior side. This is the first record of the genus in Madagascar; and I have not been able to associate the species with any of the forms described from the adjacent continent.

SPHÆRIUM MADAGASCARIENSE, Tristram.

Sphærium madagascariense, Tristram, Proc. Zool. Soc. 1863, p. 61; Sowerby, Conch. Icon. pl. iii. f. 22, bad!

Hab. Two days west of Antananarivo (*Tristram*); about 20 miles from the capital (*Johnson*); Betsileo (*Cowan*).

This species is scarcely if at all different from *S. capense* of Krauss, and is mainly distinguished by difference in locality. The slight compression of the valves towards the circumference, remarked upon by Tristram, is not constant in all specimens, some exhibiting it in a comparatively decided manner, whilst others are rounded at that part just like the South-African form.

LIMOSINA FERRUGINEA, Krauss.

Cyclas ferruginea, Krauss, Sudafr. Moll. p. 7, pl. i. f. 7; Clessin (as *Limosina*), Conch. Cab. p. 247, pl. 46. f. 1–4; Sowerby (as *Sphærium*), Conch. Icon. f. 47, not good!

Hab. The river Knysna, South Africa (*Krauss*). About 20 miles from Antananarivo (*Johnson*). Also Mauritius (*Brit. Mus.*).

The specimens from Madagascar agree exactly with a typical example of this species purchased by the British Museum of Dr. Krauss. The figure in the 'Conchylien-Cabinet' appears to be far more characteristic than that in Krauss's work.

Pisidium johnsoni, sp. nov. (Plate XXII. figs. 28, 29.)

Shell minute, ventricose, inequilateral, glossy, finely concentrically striated, pale grey. Umbones large, inflated, without a small pointed nucleus. Posterior side longer and narrower than the anterior, obliquely sloping from the beaks, rounded at the extremity; anterior end broader, blunter.

Length 2 millim., width 2⅓, diam. 1½.

Hab. About 20 miles from Antananarivo (*Johnson*).

This species is considerably like *P. ventricosum* of Prime, but is not not quite so swollen or so inequilateral. The beaks take the form of an apical glossy cap without any small pointed apex. The ligament is small and linear.

EXPLANATION OF THE PLATES.

Plate XXI.

Fig. 1. *Cyclostoma congener*, p. 377.
2. —— *betsileoense*, p. 376.
3. —— ——, var., p. 377.
4, 5. —— *johnsoni*, p. 378.
6, 7. *Vitrina madagascariensis*, p. 379.
8, 9. *Helix (Nanina) cleamesi*, p. 379.
10, 11, 12. —— (*Macrocyclis?*) *covani*, p. 381.
13, 14. —— (*Helicophanta*) *bicingulata*, p. 380.

Plate XXII.

Figs. 1, 2, 3. *Helix* (*Ampelita*) *shavi*, p. 382.
4. *Bulimus* (*Rhachis*) *nigrilineatus*, p. 382.
5. *Stenogyra* (*Clavator*) *johnsoni*, p. 382.
6. *Melanatria johnsoni*, p. 383.
7. Ditto, lateral view of labrum.
8, 9. *Ampullaria madagascariensis*, p. 384.
10, 11. *Cleopatra trabonjiensis*, p. 384.
12, 13. *Limnæa electa*, p. 385.
14, 15. *Physa lamellata*, p. 386.
16, 17. —— *obtusispira*, p. 386.
18, 19. —— *madagascariensis*, p. 386.
20, 21, 22. *Planorbis madagascariensis*, p. 387.
23, 24. *Neritina fulgetrum*, p. 387.
25, 26, 27. *Corbicula madagascariensis*, p. 388.
28, 29. *Pisidium johnsoni*, p. 389.

Mr. Sclater exhibited a drawing by Mr. Smit (Plate XXIII.) of the Tapir presented to the Society by Mr. Fritz Zurcher on the 13th of August last, and read extracts from some letters received from Mr. Zurcher on the subject, whereby it appeared that this animal had been captured on the Yuruari river in Venezuela when about eight months old (as was believed), and had been kept 15 months in captivity before being forwarded to this country. Its probable age was therefore now about three years.

Mr. Sclater pointed out that in colour this animal appeared to agree better with the figure of *Tapirus dowi* (as represented in Godman and Salvin's Biol. Centr.-Am., Mamm. p. 104, t. ix.) than with the ordinary *Tapirus americanus*; and suggested that it was quite likely that the former species might be the Tapir of the lower Andean range of Venezuela. But this point could only be decided by anatomical examination after the death of the animal.

Mr. J. E. Harting, F.Z.S., called attention to the desirability of adopting a standard of nomenclature for the description of the colours of natural objects, and made the following remarks:—

"In the animal kingdom the number of colours is very great. They often form the most striking feature in the external appearance of species, and hence have been considered by systematists as affording distinguishing characters of much value. But an object may be described as of one colour by one person, and be taken by another person for quite a different tint; for the names of colours are frequently misapplied, and one name is often indiscriminately given to many colours. Hence arises an uncertainty in reading, and a perplexity in writing, a description, which would be obviated were some standard of nomenclature available for general reference.

"So long ago as 1821, there appeared a manual the utility of which seems to have been quite lost sight of, owing perhaps chiefly to the fact that it has long been out of print and difficult to procure—namely, Werner's 'Nomenclature of Colours,' edited by Syme. This work, excellent in principle, was designed to meet the very want which I now venture to express, but which was hardly experienced at the date of its publication, inasmuch as it was not then the general practice to publish the careful and detailed descriptions of species with which we are now familiar. Thus the book was neglected, and is now almost forgotten.

"In my humble opinion, if a new edition of this work were to appear it would be extremely useful to zoologists, not only in this country, but in other parts of the world—wherever, in fact, zoological science is cultivated.

"Assuming the want of such a standard nomenclature and the desirability of satisfying it, I venture to think that in no way could this be better accomplished than by the publication of a new edition of Werner's 'Nomenclature of Colours' under the auspices of this Society.

"Such a course would ensure the speedy adoption of the standard, and would be the means of obviating in future the confusion which at present prevails for want of it."

The following papers were read :—

1. On the Cranium of a new Species of *Hyperoodon* from the Australian Seas. By William Henry Flower, LL.D., F.R.S., P.Z.S., &c.

[Received April 18, 1882.]

Dr. Günther has been so good as to submit to my examination the cranium of a Cetacean lately added to the British-Museum collection which presents sufficient interest to justify its being brought before the notice of this Society. The specimen was found upon the sea-beach of Lewis Island in Dampier Archipelago, North-western Australia.

Unfortunately the cranium is in a greatly mutilated state, having evidently been rolled for a considerable period among pebbles and sand, from which cause many of its most important characters are destroyed. The lower jaw is wanting. The whole of the elongated narrow part of the rostrum is broken away. There is therefore nothing remaining to indicate the character of the dentition. Many prominent parts of the cranium, especially the supraorbital ridges, are worn down to such an extent that their contour is completely destroyed. This, as seen in figure 1 (p. 393), is carried to a greater extent upon the right than the left side. The slender jugal arches and the petrotympanic bones have disappeared. There is, however, enough remaining to show that it does not belong to any known species, and also to indicate, as far as they may be inferred from the cranium alone, its affinities. It should be premised that the animal to which it belonged was not very aged, as the sutures are mostly open; but there is no reason for supposing that it had not arrived at its full size.

It is evidently one of the Ziphioids; and as the characters of the four generic modifications of this group are plainly indicated in the conformation of the upper surface of the cranium (see 'Transactions of the Zoological Society,' vol. viii. p. 203), which is here well preserved, there is no difficulty in recognizing that it is neither a *Berardius*, nor a *Ziphius*, nor a *Mesoplodon*, but that it comes so near to *Hyperoodon* that it is only with animals of that genus that it will be necessary to compare it.

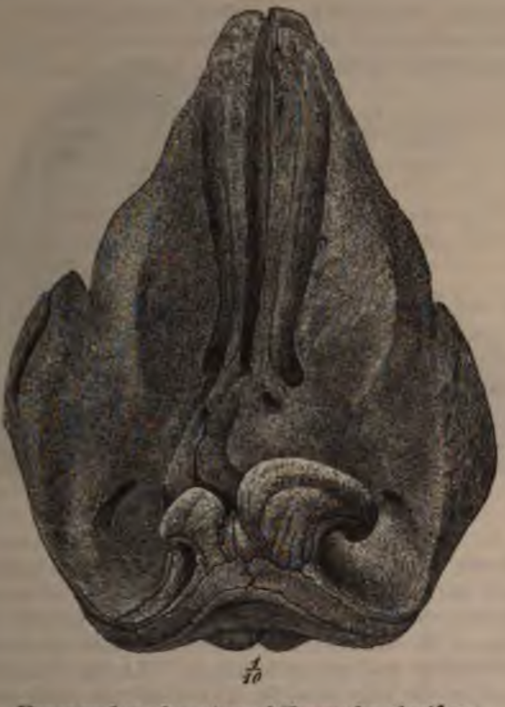
An adult skull of the common species, *H. rostratus*, in the British-Museum collection, which presents all the typical characters of its kind, will serve very well for the purpose.

Although the proportions differ somewhat, in general size the two are nearly equal, the *H. rostratus*, on the whole, having the advantage.

In the posterior or occipital aspect, the new cranium differs from that of *H. rostratus* in being narrower and somewhat higher, and the foramen magnum and the condyles are considerably smaller, as seen by the following dimensions :—

	H. planifrons. millim.	*H. rostratus.* millim.
Height of supraoccipital, from upper margin of foramen magnum to top of occipital crest	375	340
Width of supraoccipital, at narrowest part between hinder margins of temporal fossæ ..	375	432
Width of foramen magnum	68	83
Width of condyles	212	257
Height of condyle	153	192

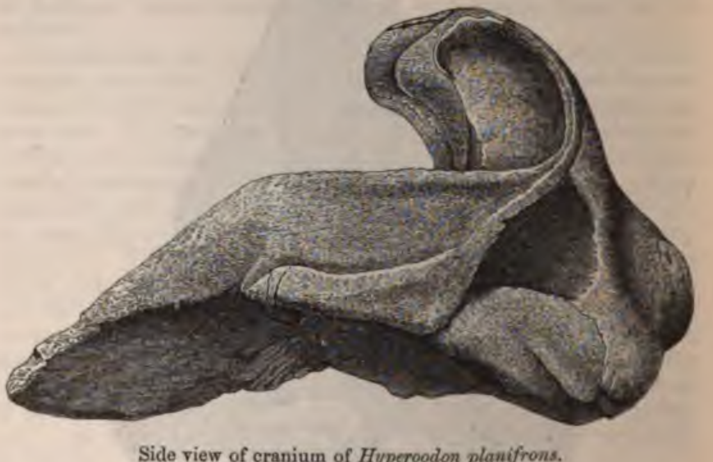
Fig. 1.



Upper surface of cranium of *Hyperoodon planifrons.*

In the upper surface (fig. 1) the want of bilateral symmetry in the region of the blowholes is extremely marked. The two characteristic prominences overhanging the anterior apertures to the nares, formed by the posterior ends of the præmaxillæ, with the nasals flanking their inner and the maxillæ their outer surface, are larger and more massive than in *Hyperoodon rostratus*, especially the right one. The groove between them is narrower. The septum between the nares is thrown exceedingly to the left side. So far, however, there is nothing essentially different from *Hyperoodon rostratus*. It is in the region immediately in front and to the side of the blowholes that the great difference is seen. This part in *H. rostratus* is characterized by the very prominent maxillary crests, the inner surfaces of which rise vertically from the outer border of the great "infraorbital"[1] foramen, the two opposed surfaces being nearly parallel with one another, or even slightly hollowed, so that their summits have a tendency to inversion. Although the amount of elevation to which the corresponding crests might have attained in the new specimen cannot be satisfactorily ascertained, as their surfaces have evidently been subjected to the attrition previously alluded to, it is perfectly evident that they differed greatly in form from those of *H. rostratus*, as the still unworn (because protected) inner surfaces slope gently outwards and upwards from the edge of the foramen, and the crests therefore, though with a base even broader from side to side than in *H. rostratus*, must have been low and rounded and quite devoid of any tendency to inversion. Another great difference (better seen in the side view, fig. 2) is that the crests do not sink abruptly at their hinder end, leaving a deeply depressed surface of the maxillary bone intervening between them and the occipital elevation, but they are continued backwards, above the temporal fossa, and so pass gradually into the occipital crests, forming a continuous outer wall to the great basin in which the blowholes are placed, which is completely interrupted in *H. rostratus*. Among minor differences,

Fig. 2.



Side view of cranium of *Hyperoodon planifrons*.

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[1] Or the foramen corresponding to the infraorbital in man, in transmitting the branch of the fifth pair of nerves that supplies the cheek and upper lip, but not infraorbital in position in the Cetaceans.

the "infraorbital" foramina are smaller—a character probably related to the smaller surface-region to be supplied by the nerves and vessels which pass through it, occasioned by the reduced size of the crests and a possibly shorter rostrum,—and that the temporal fossa is shorter from before backwards, and higher vertically, more resembling that of *Ziphius cavirostris*.

There is little, in such portions of the under surface of the skull as are preserved, that shows any striking difference from the common species.

A sufficient portion of the vomer is preserved to show that it was not complicated by the adherence to it of an ossified medio-rostral bone, in which respect it agrees with all known specimens of *Hyperoodon* and *Berardius*, and differs from the adults of *Ziphius* and *Mesoplodon*.

Owing to the destruction of some of the more prominent of the external parts of the cranium, very few dimensions can be given beyond those at p. 393; but the following comparisons may be useful:—

	H. planifrons. millim.	*H. rostratus.* millim.
Width between anteorbital notches........	432	385
Width of base of each maxillary crest opposite anteorbital notches................	160	127
Interval between crests..................	105	130

As the cranium thus differs from that of *H. rostratus* in the comparative lowness and rounded form of the maxillary crests, from *H. latifrons* (with its enormous, vertically raised, flat-topped and converging crests) it deviates in a so much more marked degree that a detailed comparison between them is quite unnecessary[1].

With so imperfect a knowledge even of the cranium, and with absolutely none of the remainder of the animal's organization, any determination of its generic affinities can only be provisional; but if the genus *Hyperoodon* include both *H. rostratus* and *H. latifrons*, there is no reason against this new form being contained in it also. If, on the other hand, they are separated, as was done by the late Dr. Gray, it would have to form a distinct genus, as it differs quite as much, or more, from *H. rostratus* in one direction as *H. latifrons* (*Lagenocetus latifrons* of Gray) does in the other. Not wishing to multiply genera, I prefer the former course, and shall consider it a *Hyperoodon*; and as it differs from both of the other species in the comparative flatness of the fore part of the head (which looks externally like, although not strictly homologous with, the animal's forehead), it may be specifically called *planifrons*. It is evidently a more generalized form than either of the known species, showing more resemblance to the other types of Ziphioids. One of its chief points of interest is the locality in which it was found. Although *Ziphius* and *Mesoplodon* are both cosmopolitan genera, and *Berardius* an inhabitant of the Southern hemisphere, no specimen of the genus *Hyperoodon* has hitherto been met with anywhere but in the North Atlantic.

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[1] *H. latifrons* is considered by some zoologists to be the adult male of *H. rostratus*. Captain David Gray, of Peterhead, who is perfectly familiar with both forms, has furnished me with some evidence strongly tending to the opposite conclusion. I hope, with further information from the same source to be collected during the present whaling-season, to be soon in a position to clear up this important and still doubtful question in cetology.

2. On three new and interesting Species of Rhopalocera.

By Dr. O. Staudinger.

[Received April 24, 1882.]

(Plate XXIV.)

Papilio hahneli, sp. n. (Plate XXIV. fig. 1.)

This wonderful new species was discovered by Dr. Hahnel in the autumn of 1880 near Massauary, on the Rio Manés, Lower Amazons. He only took the ♂ here figured and a somewhat damaged ♀, just like the ♂, only a little larger, and the anal angle of the under wings not produced as in the ♂.

The fore wings of this species remind one of the genus *Thyridia*. *Papilio hahneli* comes nearest to *P. triopas*, Godt., although quite distinct from it.

Length of the fore wing of the ♂ 48 millimetres, of the ♀ 51 millimetres. Fore wings black, with three transparent smoky yellow spots at the base after the middle and near the apex. Hind wings yellowish, deeply bordered with black, the outer margin serrate and with a long tail on costa (4 sect. *Herrich-Schäffer*).

The anal angle in the ♂ is very sharp and produced, in the ♀ very slightly so, but rather rectangular.

Head, body, and legs black, excepting a carmine spot on each side at the base of the body; the female has a similar spot below the anal segment, which the male has not. There is also a trace of a little reddish spot below the head (on the prothorax), and some reddish hairs on the mesothorax above the middle legs.

I have named this species in honour of the discoverer Dr. Hahnel, who is doubtless one of our best collectors, and has discovered other new species of Lepidoptera on the Amazons, where he is still at work.

Heliconius venus, sp. n. (Plate XXIV. fig. 2.)

This new species was taken by Herr E. Trötsch on the river San Juan, in Colombia, in some numbers, together with almost equal numbers of *H. vulcanus*, Butler.

Both species are at the first sight very similar, almost exactly so. They are black, with broad red spots behind the middle of the fore wings. They are distinguishable by the following characters:—*H. venus* has on the upperside a brilliant deep steel-blue reflection, which in *H. vulcanus* is not the case, but the black has rather a greenish reflection. The red of the band is in *H. vulcanus* more fiery, the band itself on an average narrower, on the outside toothed, and extended further down. On the upperside of the hind wings the anterior margin in the males of *H. vulcanus* is yellowish, whilst in *H. venus* it is grey.

The fringe in *H. vulcanus* is distinctly veined black and white, in *H. venus* it is clear white. This can only be seen in fresh specimens.

On the underside of the fore wing the red band in *H. vulcanus* is fainter, in the middle especially mixed with white, which is not the case in *H. venus*. At the base of the anterior margin is found in *H. vulcanus* a short sharp red streak, which is always wanting in *H. venus*.

On the underside of the hind wings the yellow streak of the anterior margin in *H. venus* is usually rather broader and longer; it is especially different in the yellow middle band, which in *H. venus* is always longer and bent upwards at the pointed end, usually extending upwards nearly to the margin. In the shorter band of *H. vulcanus* the obtuse end bends, on the contrary, rather downwards. In *H. vulcanus* also it is sharply defined, and not so in *H. venus*. In some specimens of *H. vulcanus*, both male and female, it is entirely wanting. *H. vulcanus* has always close to the base one or two red points, which are very rare in *H. venus*.

Both species have the palpi white beneath, and spots on the head and prothorax. The short fore legs are white in *H. venus*, but yellowish in fresh specimens of *H. vulcanus*. The underside of the abdomen is also yellower in *H. vulcanus* than in *H. venus*.

HELICONIUS GODMANI, sp. n. (Plate XXIV. fig. 3.)

I received a small number of this species, which I name in honour of Mr. F. DuCane Godman, also through Herr E. Trötsch, from the Rio San Juan, in Western Colombia. *H. godmani* is nearly allied to *H. gynæsia*, Hew., but is certainly distinct from it.

The fore wings in both are black with yellow spots; but the spots are different: *H. godmani* has on the end of the posterior margin a rather long yellow stripe, which is wanting in *H. gynæsia*.

On the outer margin are seven or eight oblong yellow spots, of which those near the apex are smallest, whilst in *H. gynæsia* these are the largest. Before these are three other yellow spots, and far below them a fourth, which, in *H. gynæsia*, is close to them.

Above the median cell on the costa is a small double spot as in *H. gynæsia*; besides this there is also another yellow spot in the middle cell which is absent in *H. gynæsia*. A male shows also at the base of the cell a fine yellow streak, which on the underside is large, triangular, and somewhat forked; and all the other spots of the upperside are, beneath, rather more strongly developed.

The hind wings are, in the females, red-brown with broad outer margin, on which are seven (in one female eight) oval yellow spots, as in *H. gynæsia*.

Beneath are eight yellow spots, and at the base of the anterior margin a fine yellow streak as well; close to it, at the base, a faded yellow spot is found.

Head black; palpi laterally white; forehead with two white streaks; top of the head with four white points; antennæ in the female brownish; prothorax above with two yellow points; abdomen below and on the sides spotted yellow.

EXPLANATION OF PLATE XXIV.

Fig. 1. *Papilio kahneli*, p. 396.
2. *Heliconius venus*, p. 396.
Fig. 3. *Heliconius godmani*, p. 397.

3. On a Collection of Butterflies from Sikkim.

By H. J. Elwes.

[Received April 24. 1882.]

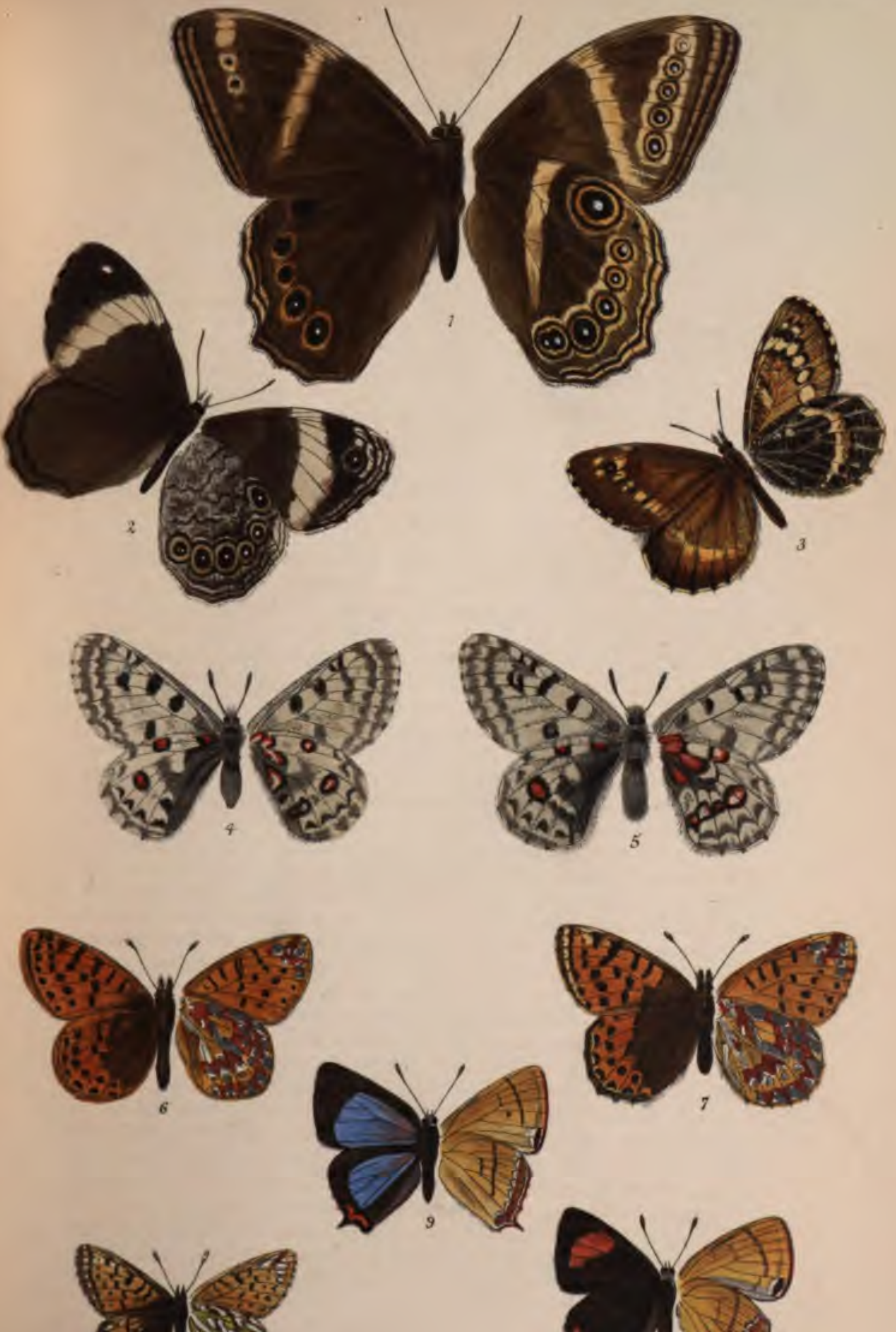
(Plate XXV.)

When at Darjeeling in 1881 with Mr. Godman, I made arrangements with a native plant-collector, a Sikkim Bhotea, who had accompanied me on two expeditions into the interior, to visit the Chumbi valley, on the Tibetan frontier of Sikkim, to collect seeds and insects. This he did during the months of August and September last; and through the kind assistance of my friend Mr. Gammie I have received a considerable number of Butterflies in papers in tolerable condition. Though I cannot be certain of the exact localities in which they were taken, I have little doubt, from my knowledge of the country and the plants which came with them, that a considerable portion of them were taken on the Tibetan side of the frontier, which has never been visited by any European, on account of the jealousy of the Tibetan officials. On two occasions I have looked down into this valley from passes 15,000-16,000 feet high on the Chola range, which bounds Sikkim on the north-east; and, judging from what I saw and from the information we have obtained through native sources, it is a valley of somewhat different climate and vegetation from the Sikkim valley, though the Machu river, which drains it, flows southwards through Bhotan to the Bay of Bengal. It is said to be much drier in summer and colder in winter than Sikkim valleys of similar elevation: and as a number of the plants and butterflies I received are not known to occur on our side of the passes, I have no doubt that the collectors passed some part, at any rate, of their time in this valley.

With the collection came a number of other species which occur at lower elevations in Sikkim, and which were probably taken on the journey up. This part of the expedition is often made to last as long as possible by these native collectors, who infinitely prefer to spend their advance-pay in feasting at some of the villages on their road to hard work in a cold climate on short commons.

The most interesting species in the collection are Palæarctic forms,

P. Z. S. 1882. Pl. XXV.



W. Purkiss lith.

BUTTERFLIES FROM SIKKIM.

Hanhart imp.

allied to or identical with others found in Ladak or in Europe. Four of these were only known before in Ladak, at a distance of about 800 miles from Sikkim; but as the intermediate country is unexplored, they probably occur all along the Himalayan frontier of Tibet.

On a future occasion I propose to compare the Butterflies of Palæarctic genera found in the Himalaya more closely with their European and N.-Asiatic congeners; but in the meantime I will enumerate those species which are of special interest in this collection, as I have no doubt that the number of species now received forms but a small proportion to those which exist at high elevations in the South-eastern Himalaya.

PAPILIO MACHAON, var. ASIATICA, Mén. Cat. Mus. Petr. i. p. 70.

A very large number of this species in good condition, and varying but very slightly amongst each other. The type in Sikkim, where the species is found at 8000–10,000 feet elevation, is darker and more heavily marked than in Europe, smaller and more uniform in colour than in Japan. It closely resembles on the upperside *Papilio zolicaon* of California, but differs considerably from that species or variety beneath.

Specimens from Nepal agree with those from Sikkim; but those from the North-west and Kashmir seem nearer to the European form in tint.

PARNASSIUS EPAPHUS.

P. epaphus, Oberthür, Ét. Ent. livr. iv. p. 23 (1879).

P. jacquemontii, Gray, Cat. Lep. Brit. Mus. p. 76, t. xii. figs. 1, 2.

This species has lately been distinguished by M. Oberthür from *P. jacquemonti*; but it is extremely difficult to say whether it is really distinct or not.

I have seen four specimens in the British Museum and three in the Hewitson collection, all that exist in England to my knowledge. These agree very well with each other and with Gray's figures. They are probably from the same part of Ladak, at an elevation of 16,000 feet, and perhaps were all taken by the same person, Major Charlton.

They differ from *P. jacquemonti* of Boisduval in being smaller and in the shape of the fore wings, which are narrower and more pointed. As a rule there are no red spots at the anal angle of the hind wing, though this is not a character of much importance. The antennæ are distinctly ringed and the fringes distinctly spotted.

PARNASSIUS EPAPHUS, var. SIKKIMENSIS, n. var. (Plate XXV. figs. 4, 5.)

I have now received from Sikkim fourteen specimens of a form which probably represents the same species in this part of the Himalaya, and which are distinguished principally by the smaller size, and by the broad white fringes distinctly marked at the end of each nerve with square black spots, which, in fact, give the fringe the appearance of being alternately black and white.

These fourteen specimens agree perfectly in form and vary but little in size. They are very similar in their pattern and tint, but the red spots do not agree in any two specimens. Some have one on the costa of fore wing, another just below it, and a third on the posterior margin. In others one, two, or all of these are yellowish, plain black, or nearly absent. On the hind wings there are usually three large black spots with red centres; but in two specimens the centre of the spots is yellow, and in one the spots are plain black.

This species, which I propose to distinguish as var. *sikkimensis*, occurs at great elevations on the frontier of Sikkim and Tibet. I took it myself on an unknown pass by which I crossed from the upper Lachoong valley to the Cholamoo lake in Tibet, at an elevation of nearly 19,000 feet, in September 1870. I found a single pair *in copulâ*, which I put in an envelope and gave to Mr. Atkinson on my return to Darjeeling. These specimens are now in the Hewitson collection, under the name of *P. simo*, which at first sight they very closely resemble. I believe, however, after careful examination of my series, and of all the specimens of *P. simo* which exist in England, that the two species are well defined by structural characters, which in this very difficult genus are of much more importance than size or colour.

PARNASSIUS ACCO.

P. acco, Gray, Cat. Lep. Brit. Mus. p. 76, t. xii. figs. 5, 6.
P. simo, Gray, *l. c.* t. xii. figs. 3, 4.

After a careful examination of the types of these species and of three others in Messrs. Godman and Salvin's, and one in the Hewitson collection, which are all that I know of in England, I have come to the conclusion that they are but varieties of one species, differing only in size and in the number and colour of the spots. They are, however, distinguished from *P. epaphus* by the colour of the fringes, which in fresh specimens are plain white, but in slightly worn ones, such as the type, are dark, but still quite plain. The antennæ also are plain black, not ringed as in *P. epaphus* and *P. sikkimensis*, and the ground-colour of the wings is distinctly greyer and less pure white than in *P. sikkimensis*. The fore wings also seem constantly more pointed at the apex, and more rounded at the posterior angle. These characters are not to be shown plainly by a figure, but are evident when a series of the insect is carefully examined.

The female figured by Gray (fig. 6) is much more heavily spotted on the hind wings than one in Mr. Godman's collection; but the species seems less variable in this respect than *P. epaphus*, none of those I have seen of *P. acco* or *P. simo* having any red marks on the fore wing. The underside is perhaps more different from *P. sikkimensis* than the upper, but the difference cannot be explained in words.

This species is known from four specimens in the British Museum and one in the Hewitson collection, collected by Major Charlton in

Ladak at 16,000 feet; besides three others in Mr. Godman's collection from Lapsang in Ladak, 17,000 feet; and a single specimen, which agrees perfectly in all the characters I have mentioned with these, and is intermediate in size between *P. acco* and *P. simo*, was among my fourteen examples of *P. sikkimensis*, showing, if my views are correct, that the species are constantly different, though they occur together in similar localities 800 or 900 miles apart.

PARNASSIUS HARDWICKII, Gray, Cat. Lep. B. M. p. 76, t. xii. figs. 8–11. Var. CHARINO, Gray, *l. c.*

A very variable species, found from Kashmir to Sikkim, from about 8000 feet up to 15,000. The variety named *P. charino* by Gray occurs at this great elevation in Ladak; and four specimens, which agree with his plate in being of much darker colour than the common form, came with *P. sikkimensis*. It may be known with certainty by the five blue eyes on the hind wing, which, so far as I have seen, are never wanting, though sometimes reduced to spots.

PIERIS BRASSICÆ, Linn.

P. brassicæ, var. *nipalensis*, Doubld. Lep. Brit. Mus. i. p. 32; Gray, Lep. Nepal, p. 9, t. 6. figs. 1, 3.

P. nipalensis, Moore, P. Z. S. 1865, p. 490.

I cannot see any reason to separate this from the European insect. A series of specimens from Sikkim, Nepal, and Kashmir average larger than British ones, but not larger than some I have from Asia Minor; and there is nothing in colour to distinguish them. There were many examples in the present collection.

PIERIS AJAKA, Moore, P. Z. S 1865, p. 490, t. xxxi. fig. 16.

A single female of an insect which for the present I refer to this species, which, however, I do not see how to separate from the forms which I have alluded to previously from Amurland and Japan (*cf.* P. Z. S. 1881, p. 876).

It is intermediate between *P. melete* and *P. napi* above, and resembles the form *bryoniæ* beneath. Similar specimens from the Khasia hills are in my collection.

DELIAS BELLADONNA, Fabr., Gray, Lep. Ins. Nepal, t. 8. fig. 2.

It seems to me that there are two species confused under this name. Those I have from Nepal agree perfectly with Gray's plate; but the Sikkim form, of which I have now secured several specimens, has in most cases no yellow on the anal angle or interior margin of hind wing. In some specimens, however, there is a trace of it; so that without knowing more of the intermediate forms in distribution, I should hesitate to separate this form.

COLIAS MYRMIDONE, Esp.

C. myrmidone, Koll., Hüg. Kasch. Reise, p. 411.

C. feildi, Mén. Cat. Mus. Petr. i. p. 79, t. 1. fig. 5.

? *C. edusa*, Gray, Lep. Ins. Nepal, t. 5. fig. 2.
C. edusa, var. *myrmidone*, Moore, P. Z. S. 1865, p. 492.

Of this species I received a very large number, mostly fresh and in good order. I agree with Kollar in thinking that it is inseparable from *C. myrmidone* of Europe, though perhaps Sikkim specimens are as a rule brighter, and the black spots on the underside of the fore wing larger and more distinct. An individual specimen from the Himalaya could not be distinguished; but I think a series might be known as from India without seeing the labels.

? **DERCAS WALLICHII**, Doubl. Proc. Ent. Soc. v. p. 47.
Gonepteryx urania, Butl. P. Z. S. 1865, p. 458, t. 26. fig. 5.

I received a single specimen which I can only doubtfully identify with this species, though if I had a series which agreed with it I should be inclined to say it was distinct. It differs from Butler's plate in the shape of the fore wings, which are more arched on the costa and much less pointed at the apex; the hind wings also appear rounder at the anal angle; the colour is much brighter, especially on the costa and near the apex of the fore wing, and the markings beneath differ slightly. *D. wallichii* is found, I believe, in the Khasias; but I never saw a specimen from Darjeeling, where *D. verhuellii* is found, but not commonly.

A specimen in the British Museum, from Shillon, nearly agrees with my example.

LYCÆNA PHERETES, Hb., var. **ASIATICA**, n. var.

I was at first disposed to consider this a new species, as it differs from *L. pheretes* in the narrower and more pointed fore wing, and in having much more green gloss on the underside; but noticing that Dr. Staudinger, in his list of the Lepidoptera of Tarbagatai in Central Asia (Stett. ent. Zeit. 1881, p. 263), mentions that *L. pheretes* has the same difference of colour there, I do not think the small number of specimens I have received (four females and two males) justify me in separating the species at present, though the difference, if constant, is considerable. I know no *Lycæna* at all like it in the Himalayas, but have received a very beautiful new species from Major Marshall, *L. ellisi*, which occurs at high elevations in the N.W. Himalaya, and seems allied to, though very distinct from it.

ILERDA SAPHIR ?, Blanch. (Plate XXV. figs. 9, 10.)
Ilerda saphir, Blanch. Compt. Rend. lxxii. p. 811 (1871)[1].

I am at present not able to say with certainty what is the proper name of this species, of which I received a fair series of both sexes. I have examined the specimens in the British Museum and in the Hewitson collection, as well as Mr. Moore's. In that gentleman's opinion it is a new species between *I. moorei*, Hew., and *I. hewit-*

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[1] There is a specimen from Bhotan in the British Museum which agrees with mine, and, as far as I can judge, it is the same as *Thecla saphir* from Moupin, in East Tibet.

soni, Moore, and resembles the former very closely above, but not below. The males have a more purple tinge on both wings than *I hewitsoni*, but the females are hardly, if at all, to be distinguished from this species, which I have taken at Darjeeling in December. The genus is a very difficult one, as there are four or five very nearly allied species in the Himalaya.

VANESSA LADAKENSIS, Moore, Yarkand Mission, Lep. p. 3, t. i. fig. 2 (1879).

About fifteen specimens, mostly worn, of this species, all of which agree in their characters, and can be known at once from the forms of *V. urticæ* by the shape of the fore wings, which are rounded at the apex, with hardly a trace of the projecting point below the angle which is conspicuous in *V. urticæ*, *V. kashmeriensis*, and *V. polychloros*. It seems to be an inhabitant of the high cold plateau of Tibet, was first taken at Gogra in Ladak, and has never been sent to England from Sikkim, to my knowledge, before; so I think we may conclude that it does not occur on this side of the passes.

VANESSA KASHMERIENSIS, Koll. Kasch. p. 442, t. ii.

Some of the specimens of this species are very near *V. rizana* of Moore, which seems to me hardly separable from it.

Sikkim specimens, as a rule, are darker than those from Kashmir. It occurs at and below Darjeeling during winter, and I have taken it on sunny December days at 4000 feet.

VANESSA C-ALBUM, Linn.

A single, rather worn specimen was included in the collection, which, until we know more of the Himalayan varieties, I prefer to call *V. c-album*. It is certainly much nearer to Amur specimens of *V. c-album* than to what I have from Mr. Moore as typical *V. agnicula*. I have only seen one specimen from Sikkim before, which differed from this one; and four others which I possess from various parts of the Himalaya differ from each other as much as a similar number of European specimens from various localities do. Unfortunately, I have but fifty specimens in all of this group—not a tithe of what would be required to illustrate it properly; but the more I see, the more impossible it seems to define them clearly. I should be much obliged to any entomologist for the loan of local series showing the amount of variation in different localities; but, so far as I can see at present, no one can say to what species a given specimen of any of these forms belongs, unless he was told where it came from; and if that be so, what more is necessary to prove my theory?

ARGYNNIS ALTISSIMA, n. sp. (Plate XXV. fig. 8.)

Of this species I received ten specimens, all of which, as well as I can judge in the somewhat crushed state of their bodies, are males. Nine of them agree very well in size and pattern; but the tenth is at least a quarter larger in size, and has the wings broader and less pointed. In fact it has the appearance of a less alpine variety than the others, which, judging from the collector's marks, were taken with *Œneis pumila* and *Parnassius* at a very great elevation. This species has a very distinct and peculiar appearance, quite unlike any other *Argynnis*. Above, the markings are generally similar in arrangement to those of *A. gemmata*; but the row of spots on the exterior margin are usually whitish, the ground-colour is paler, and the fringes spotted with white.

Beneath, the position and arrangement of the markings are very similar to those of *A. gemmata*; but all the silvery spots are more elongated and less brilliant, and the deep fulvous markings are almost absent.

Expanse 1·1 inch, except the single specimen above mentioned, which is 1·4 inch across.

ARGYNNIS GEMMATA. (Plate XXV. figs. 6, 7.)

A. gemmata, Butler, Ann. Nat. Hist. 1881, vii. p. 32; Elwes, *l. c.* 1881, vii. p. 467.

Of this distinct and lovely species I received a considerable number of both sexes, which I take the opportunity of figuring here, as a coloured plate is necessary to give an idea of its beauty. The females differ from the males in having the base and posterior margin of the fore wing grey, and the marginal spots pale outside; the fringes also are pale-spotted, which is not the case in the males. This species must be very abundant at some localities, probably at a great elevation; and it is just possible that *A. altissima* is a still more alpine form of it, analogous to *A. melitæa*, var. *merope*, though more different from *A. gemmata* than *A. merope* is from *A. aurinia*.

ARGYNNIS CHILDRENI, Gray, Zool. Misc. p. 33; Lep. Ins. Nep. p. 11, t. 11.

A single pair of this fine species.

AGRYNNIS LATHONIA, Linn.

A. issæa, Moore, apud Gray, Lep. Ins. Nep. p. 11.

Moore seems to have followed Gray, who followed Doubleday, in separating the Himalayan form from the European one. I cannot find that any description of it has been published; and I agree with Kollar in saying that it is identical with *A. lathonia*, though a large series of specimens seem somewhat larger and darker than a series from various parts of Europe. There were some hundreds in the present collection; but the insect is not common near Darjeeling.

CHIONOBAS PUMILUS. (Plate XXV. fig. 3.)

C. pumilus, Feld. Reise Nov. p. 490, t. 69.

Ten specimens agree very fairly with Felder's plate; but the markings are more distinct and well defined, especially the outer edge of the band on the hind wing. My specimens are also darker in colour and less yellow in tint than the figure of *C. pumilus*. As the papers containing these specimens were marked in Tibetan with the same characters as the *Parnassius*, I presume they were taken at the e and place. *C. pumilus* was found by the late Dr. Stoliczka ak Pass (15,500 feet) in Ladak, and has never been ne else as far as I know. There are no specimens of it llections that Mr. Moore or I have seen.

(TANSIMA, Moore) MASONI, n. sp. (Plate XXV. fig. 2.)

mbles *Debis verma*, Koll., in general appearance, size, form, colour, but distinguished on the upperside by a single white ot near the apex of the fore wing, which is slightly undulate and ringed white; the anterior angle of the hind wing is bordered and fringed white. On the underside there is one ocellus close to the white spot near the apex of fore wing, and the ground-colour of the hind wings is overlaid with greyish scales, and without the transverse steely bands of *D. verma*. The ocelli resemble those of *D. verma* in number, size, and position, but are ringed with hair-brown instead of fulvous. The sexes do not differ.

Of this species, which, though allied to *D. verma* and to *D. isana*, Koll., is very distinct, I received a large number of specimens, which do not vary. As this insect has never been taken before, I imagine it to be from the Chumbi valley, on the other side of the passes, but it is probably not found at extreme elevations.

LETHE (?) MARGARITÆ, n. sp. (Plate XXV. fig. 1.)

A single male specimen of this fine and distinct species was in the collection, and appears very distinct from any thing which has been described. At first sight it seems most nearly allied to *Neorina hilda*, but does not quite agree with that species in neuration. Neither does it agree exactly with either *Zophoessa* or *Lethe*, though it somewhat resembles *L. lunaris*, Butler, in markings. Until we know more of the insect, it will be best to leave it in the genus *Lethe*, which requires careful revision, as the species at present comprised in it are very varied.

Antennæ in size and shape like those of *N. hilda*, rufous with reddish tip. Palpi longer, more pointed, and less hairy than in *N. hilda*. Abdomen and legs rather shorter.

Colour hair-brown, paler beneath, with a transverse pale fawn-coloured band beyond the disk, well defined on underside and fainter above. A similar band near the margin of the wing at an acute angle to the first, enclosing five white-pupilled ocelli in a straight row. On the exterior margin are two narrow lines of similar colour to the bands. Pattern of hind wings beneath somewhat similar, but the transverse band is rather curved outwards, and there is a large ocellus between the first and second subcostal nervule. The ocellus at anal angle has a double pupil. The bands on hind wing do not show on the upperside, and the ocelli are indistinct.

Expanse 3·1 inches.

NEORINA HILDA, Doubl. & Westw. Gen. D. L. p. 369, t. 65. fig. 2.

A single male specimen of this fine species, taken probably in the lower valleys of the interior, was in the collection.

ZOPHOESSA ATKINSONIA.

Z. atkinsonia, Hew. Ent. Mo. Mag. 1876, p. 151; Hewits, Desc. Lep. in Coll. Atkinson, 1879, p. 2, t. 1. figs. 2, 3.

One specimen of this species, which is found at about 8000 feet near Darjeeling, and probably in the interior.

The published figure of this species is bad, being much too rufous, and the markings much brighter than in any of four specimens in my collection. The type, however, is somewhat brighter than the average.

SATYRUS PADMA, Koll. Kaschm. p. 445, t. xv. figs. 1, 2.

I received twenty specimens of a species which, if not identical with, is very close to *S. padma*, though not so large as Kollar's figure, and differing somewhat in the underside of the wing from any examples I have from the north-west.

The white spot on the costal margin seems to distinguish this from any other species in my collection except *S. weranga*, Lang, which is much smaller; but all these Himalayan *Satyri* are very nearly allied, and we do not yet know much about them.

MYCALESIS VISALA, Moore, Cat. Lep. E.I. C. p. 230.

A single pair of this species, which is not uncommon near Darjeeling. The apex of the fore wing is sharply angled, almost pointed. The female differs only in larger size and paler colour.

MYCALESIS, sp.

A single female specimen, which at present I am not able to determine.

YPTHIMA SAKRA, Moore, Cat. Lep. E.I. C. p. 286.

A large number of this species, mostly in bad condition. The ocelli vary from three to five above in the males; but the females, besides being paler in colour above, have usually an additional small ocellus on the fore wing.

YPTHIMA, sp.

A single male specimen, which I cannot identify with any known species, but which I refrain from naming, as it seems to me there are already too many names in this difficult and little understood genus. It is 1½ inch in expanse, dark brown above, with large dark ocellus, ringed yellow and double-pupilled, on fore wing above. On the hind wing one large central double ocellus and two small ones. Beneath it is grey, with minute pale brown striæ and two irregular transverse fasciæ on both wings. Margin darker. Hind wing with three double ocelli in a paler band. It resembles *Y. methora*, Hew., more than any other species I know, but differs considerably beneath from a Burmese specimen of that insect.

HALPE SIKKIMA, Moore, n. sp.

A single specimen only of this species, of which, as of the next, the description has been supplied by Mr. F. Moore.

Allied to *H. beturia*. *Male*. Differs from same sex of that species in the fore wing being more acute at the apex, and the exterior margin less convex; the hind wing also is less convex externally, the colour is much darker olivaceous brown. Upperside of fore wing with similar spots, the two conjoined spots before the apex less obliquely situated, the two discal spots slightly less separated. Underside also darker, the olive-yellowish scales uniformly disposed and not forming a marginal macular band or discal fascia on the hind wing. Cilia of both wings brownish white throughout, not alternated with black as in *H. beturia*.

Expanse $1\frac{2}{8}$ inch.

Hab. Sikkim. In coll. H. J. Elwes.

In shape of wings and coloration this species is somewhat like *H. varia* of Japan.

HALPE SEPARATA, Moore, n. sp.

A pair only of this new species.

Male. Also allied to *H. beturia*. Fore wing comparatively shorter and the hind wing broader; fore wing with three conjoined small subapical yellowish-white spots, a transverse spot at upper end of the cell, and two widely separated spots on the disk. Cilia brownish white, alternated with dark brown. Underside, with the costal and outer borders of fore wing and entire hind wing covered with golden-olive scales; posterior border of fore wing yellow.

Expanse $1\frac{2}{10}$ inch.

Hab. Sikkim. In coll. H. J. Elwes.

THANAOS STIGMATA, Moore, P. Z. S. 1878, p. 694.

One damaged specimen only of this rare species.

HESPERIA DARA, Koll. Kaschm. p. 455.

A single specimen, which is considered by Mr. Moore to be the same as *H. dara* of Kollar. It appears to be very close to *H. flava*, Murr., from Japan, and also to *H. mœsoides*, Butl., which I have from Sikkim.

EXPLANATION OF PLATE XXV.

Fig. 1. *Lethe* (?) *margaritæ*, p. 405.
2. *Debis* (*Tansima*) *masoni*, p. 405.
3. *Chionobas pumilus*, p. 404.
4. *Parnassius epaphus*, var. *sikkimensis* ♀, p. 399.
5. ——— ——— ♂.
6. *Argynnis gemmata* ♂, p. 404.
7. ——— ——— ♀.
8. ——— *altissima*, p. 403.
9. *Ilerda saphir* ? ♂, p. 402.
10. ——— ——— ♀.

4. Description of a new Species of Parrot of the Genus *Nymphicus*. By Edgar L. Layard, C.M.G., F.Z.S., &c., H.B.M. Consul, and E. Leopold C. Layard, Vice-Consul at Noumea, New Caledonia.

[Received April 28, 1882.]

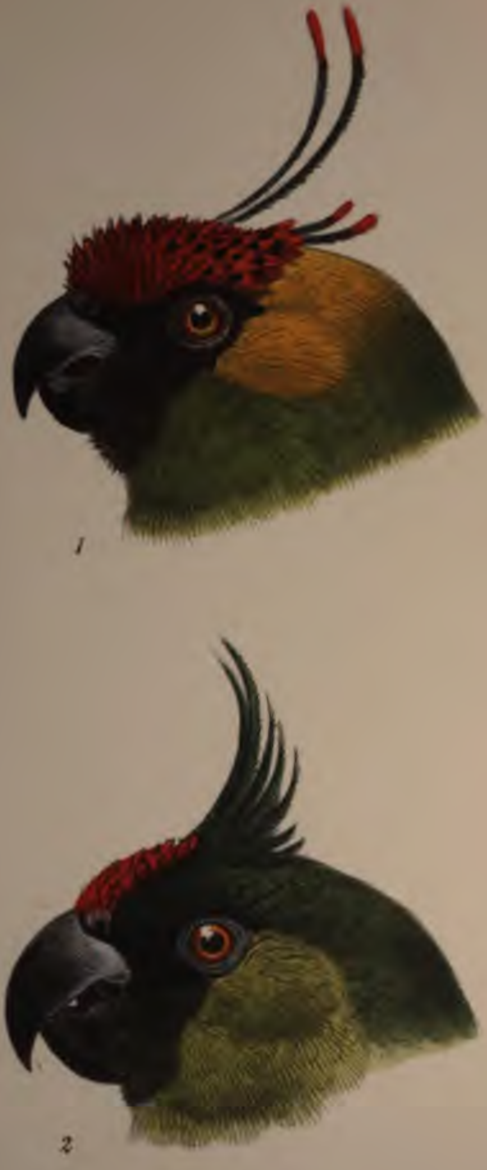
(Plate XXVI.)

We have had in our possession for some time a pair of Parrots (♂ and ♀) which we have unaccountably overlooked, mistaking them for immature birds of *Nymphicus cornutus*. A better acquaintance with the latter, owing to our having killed many of them, and having had examples of the two species before us at the same time, has caused us to detect the differences, and we have much pleasure in introducing this new species to science.

It is interesting as being confined to the small island of Uvéa, one of the Loyalties, which is perhaps, strictly speaking, a series of small islets, joined together by a connecting reef, having a lagoon in the centre. We presume, though we have no certain knowledge, that the bird is found chiefly on the large or main island, which faces Lifou, and it is very remarkable that it does not extend to that island. A friend, however, wrote us word, some months since, that, after the hurricane at the beginning of last year, "crested Parrots" had appeared in Lifou. We will make further inquiries now our attention is turned to the subject, and find out to which species they belong; we had set them down as *N. cornutus* of course. The Parrot common on Lifou is, as we have already shown, *Trichoglossus massena*, Bp. (*cf.* Ibis, 1879, p. 185, &c.).

Nymphicus uvæensis, as we propose to call this new species (from the locality where it is found), may be thus described:—Closely resembling *N. cornutus*, but wanting the red head, orange occiput, and nuchal collar, and exhibiting only the faintest trace, if at all (in some, not at all), of the orange on the rump. The crest also is totally different. In *N. cornutus* (Plate XXVI. fig. 1) the crest is usually composed of two feathers (we have seen three when one was about to be shed) much elongated; 2 inches is a good average length; we have seen specimens (one now lies before us) in which it is 3 inches long. The feathers are black, faintly tinged with green, and broadly tipped with red; they spring from the centre of the broad red cap which covers the whole of the top of the head.

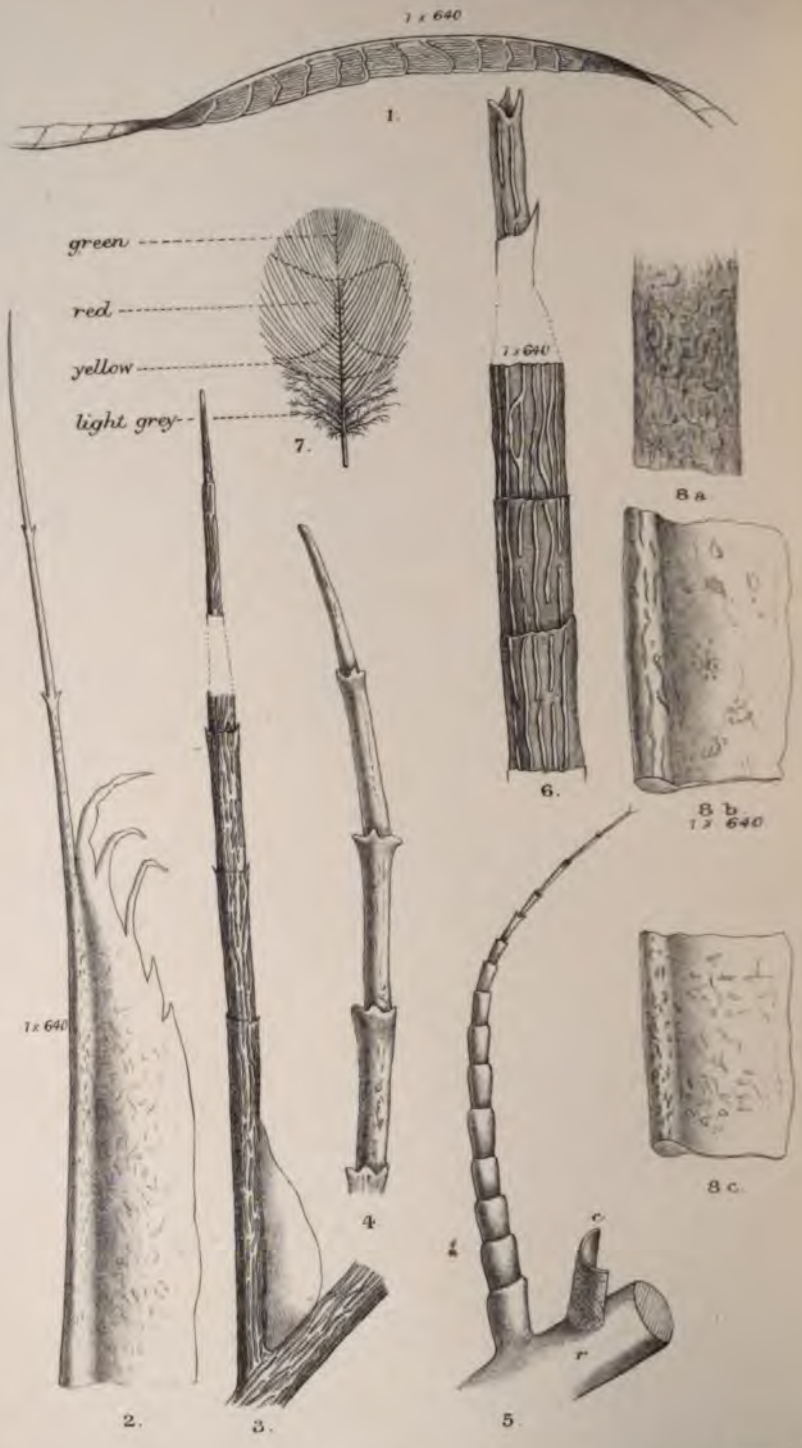
In *N. uvæensis* (Plate XXVI. fig. 2) the crest is a bunch of six, short, upturned, and entirely green feathers, springing from the end of a small spot of red, that occupies the centre of the forehead, commencing at the nostrils. The crest-feathers are only an inch and a half long. In *N. cornutus* the red cap reaches nearly to the eye, from which it is separated by the black of the cheeks, which fills up the space to the bill, and extends under the chin. All this is wanting in *N. uvæensis*: the black is changed to a dark green, except just on the nostrils, and the ear-coverts and lower part of the cheeks are bright green.



J. Smit lith.

Hanhart i

1. NYMPHICUS CORNUTUS.
2. " UVÆENSIS.

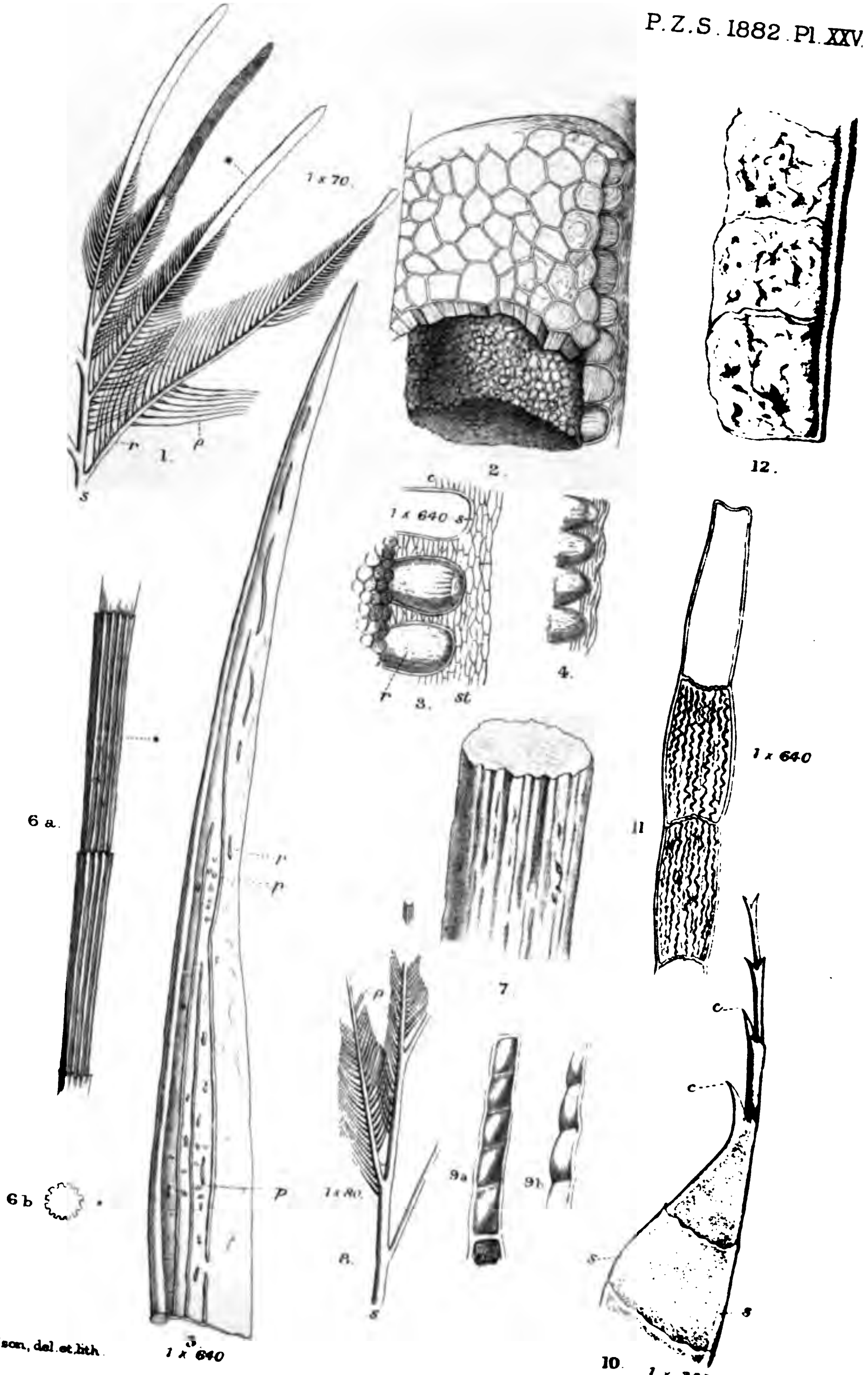


Edwin Wilson, del. et lith.

Mintern Bros. imp.

STRUCTURE OF FEATHERS.

P.Z.S. 1882. Pl. XXV.



Wilson, del. et lith.

STRUCTURE OF FEATHERS

Mintern Bros. imp.

The broad nuchal collar of orange of *N. cornutus* is altogether wanting, and there is no difference between the colour of this part of the back.

We observe that the brilliant blue of the primaries of *N. cornutus* is much dimmer in *N. uvæensis*; but this may result from our specimens being caged birds, and consequently not in such perfect plumage. In size and shape the two species are identical.

5. On the Colour of Feathers as affected by their Structure. By Dr. Hans Gadow.

[Received May 2, 1882.]

(Plates XXVII. & XXVIII.)

The colours which we perceive in the things surrounding us may result from various sources, according to which they may be divided into two classes.

The FIRST CLASS consists of so-called objective, chemical, or absorption colours. Such colours do not change or vary under any position of the light or eye; they receive their colour always from a colouring-matter. This may exist in the form of a solution or as pigment. Animal objective colours are mostly due to pigment.

The SECOND CLASS has been variously described as subjective, physical, or structural colours. They are the result of reflected or broken light. This may take place in various ways: —

1. *Total reflection of light*, e. g. the gloss on a polished surface.
2. The light may be broken infinitely often and be totally reflected. The result of this is *white*.
3. *Diffraction* by a prism.
4. *Interference of colours*. By this theory are explained the colours of extremely thin transparent plates, and those which are produced by a system of narrow ridges, *e. g.* iridescence of mother-of-pearl, the blue-heat stage of steel, and the colour of soap-bubbles.

As I have not, in this communication, entered into any general history of the colours of birds' feathers, but have confined myself to the effects of structure, it appears unnecessary to give any detailed critical account of the work of my predecessors, which should only make part of an elaborate and complete essay. The titles of the more important papers, however, are given in the footnote[1].

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[1] B. Altum, "Ueber die Farben der Vogelfedern im Allgemeinen, und über das Schillern insbesondere," Naumannia, 1854, p. 293.

B. Altum, "Ueber den Bau der Federn als Grund ihre Färbung," Journ. f. Orn. 1854, pp. xix–xxxv.

A. Bogdanow, "Note sur le pigment des plumes des Oiseaux," Bullet. de la Soc. d. Naturalistes de Moscou, 1856, p. 458.

V. Fatio, "Des divers modifications dans les formes et la coloration des plumes," Mém. Soc. phys. hist. nat. Genève, xviii. (1866), p. 249, plates.

K. W. Krukenberg, 'Vergleich. physiolog. Studien,' ser. 1. pt. v., ser. 2. pt. i.

[See also a further contribution (ser. 2. pt. ii.) which has only come into my hands as the revise is leaving them.—H. G., *July 25th*.]

Application of the Laws of Colours to Feathers.

I. PIGMENT-COLOURS. The simplest case. It has long been a matter of discussion whether or not pigment exists in feathers on account of its never having been successfully extracted. Recently, however, various pigments have been discovered. What we know at present about pigment in feathers is almost entirely the result of the investigations of Bogdanow and Krukenberg.

Pigment may produce the following colours:—

Black, resulting from the presence of ***zoomelanin***, a colouring-matter which is probably identical with the melanin of the Chorioidea. This is the pigment most universally found in the animal kingdom, and almost every "black" feather owes its colour to this pigment.

Brown. *Zooxanthin*, found in brown feathers. A mixture of this and the former pigment would of course give black-brown.

Red. The best studied feather-pigment is the ***turacin*** in the red quills of the Musophagidæ. This very peculiar stuff has hitherto only been found in the Touracous.

Another red pigment is the ***zooerythrin***; first extracted by Bogdanow from *Calurus auriceps*, and, as a pinkish matter, from *Cotinga cærulea*. The same matter produces the red in the wattle round the eye of the Black Cock (hence called by Wurm, its discoverer, ***tetraonerythrin***). Zooerythrin has been found in very different birds, which, like *Phœnicopterus*, *Cardinalis*, *Ibis*, and *Cacatua*, have more or less red in their plumage; it is therefore very probable that red is generally produced by this pigment.

Allied to the zooerythrin is the ***zoorubin***, a red-brown matter in the feathers of *Cicinnurus regius*.

Zoofulvin is a yellow to greenish-yellow pigment.

Turacoverdin is found in the green feathers of the Touracous. In other green feathers no green pigment has hitherto been found, and the same applies to blue and violet.

We may be almost certain that, wherever we have feathers with the various shades of black, brown, red, and yellow, if these feathers do not change their colour in different positions of the eye, their colour is merely due to a pigment. But there may be complication; if, for instance, the deeper strata contain a black, and the upper ones superimposed red pigment, the whole will appear dark red. Or if we take red with a superimposed yellow layer, the result will be orange. The richness of colours will often entirely depend on the amount of pigment, *e. g.* grey.

II. *By* DIFFRACTION *and* REFLECTION we can explain the following phenomena in feathers:—

1. *White*. There is no white pigment or white objective colour in natural objects; and wherever we have a white object, its colour is due to there being an innumerable number of interstices between its molecules, or air-cells in its substance. The whole substance of a white feather, the ceratinine, is colourless, but its texture forms a fine network.

2. *Simple reflection of light*. The *gloss* of feathers, independent of

the colour itself, is the result of their surface being smooth and polished: if the surface is rough, the colours given to the feather by pigment appear more or less dull; but if polished, they will appear with a more or less strong gloss, and they will look much more saturated, *e.g.* brilliant red. The polished surface is produced by the horny substance of the feathers.

3. *Interference of colours* and *colour of thin plates*. The thin plates are represented by the extremely thin laminæ of the radii, or by a thin coating of the transparent ceratinine. These parts appear with a certain colour simply because they are thin; but instances of this are very rare, although the planes of the barbules are certainly thin enough to allow the application of colours of thin plates. In *Galbula tombacea*, for instance, the thickness of such a barbule-plane, where it contained only little or no pigment, was under the microscope certainly *less* than 0·1 of one smallest division of the micrometer. The index of actual value for one division, with the power applied, was 0·0063, thus giving an actual value less than 0·0006 mm. The so called iridescence of feathers might be thus explained. An underlying pigment complicates the problem a little. A smooth, glossy surface may likewise be produced by a fine film of oil on the surface of the feathers, *e.g.* in water-birds.

Application of the Theory of Colours which are produced by a system of narrow ridges.

Almost every fine feather exhibits a sort of iridescence if we look through it towards the light. The system of fine lines is then represented by the series of radii or barbules on either side of the rami or barbs. That these parts are minute enough for this is proved by observation. We know that "Gitterfarben" begin to be visible to the naked eye if there are about twenty interstices to a millimetre. Now in a feather taken from the neck of *Pitta* (in the green part of the feather figured), I found the distance between the top of the two neighbouring barbules equal to 0·05 mm., or at another part = 0·04 mm.

Explanation of the Objective structural Colours,

i.e. colours which are due to a particular structure of the feather-substance, which contain a pigment differently coloured from the colour actually observed, and which are not variable.

Blue feathers.—All attempts made by chemists to find a blue or a violet pigment in feathers have been unsuccessful. Such feathers contain only a black-brown to yellow pigment. The simplest proof of this astonishing fact is that such feathers, if examined with transmitted light under the microscope, appear invariably brown. The blue feathers of Parrots lose this colour if held against the light, *i.e.* if examined under indirect light.

Moreover, we can make a crucial test. If certain colours result from a particular surface-structure of the feathers, these colours must disappear if we destroy the supposed colour-producing parts. This can actually be done. If we press one of the deep-blue feathers of a Maccaw between two hard planes, so as to squash or smash the stratum of prismatic cones, or if we hammer it carefully, the blue immediately disappears, and the injured part looks grey or brownish according to the underlying pigment. The same is the case with the beautifully blue feathers of *Artamia*. Green parrot-feathers, when treated in a similar way, become yellow, since this is the colour of their pigment. Thus structural or optical colour may, so to speak, be knocked out of a feather. (Fatio observed that blue disappears after injuring the surface by scratching off some of the enamel.) This explains the dark appearance of the abraded parts of feathers of Parrots and other vividly coloured birds. Again, red, orange, brown, black, and most of the yellow feathers (*i. e.* such which owe their colour directly to pigment) do not lose or change their colour under any physical treatment.

The explanation of the *blue* colour is the most difficult of all in those feathers where the blue is independent of the position of the eye, *i. e.* in which the blue does not change. In most cases the blue is confined to the rami, which, for instance in *Cœreba* and in *Artamia*, in the blue parts of the feather are devoid of cilia and radii, and are broader and flattened out (*cf.* Fatio).

With a magnifying-power of about 640, we first observe that the whole ramus is covered by a transparent, slightly yellowish, or perhaps quite colourless, sheath or coating, the thickness of which is not more than 0·0014 of a millimetre. The surface of this sheath is uneven and granulated. Immediately under this sheath we find one continuous layer of prismatic polygonal (frequently hexagonal) cells or cones. Most of these cones are broadest at their apices, and become smaller towards their bases; others have nearly parallel walls or may be broadest below. (This layer of cones has been called by Fatio, its discoverer, "émail.") The space between their apices seems to be filled up with the same matter as the coating. The colour of the cones is pale yellowish, or, if this is only the reflection of the underlying pigment, they are colourless. The distance between the middle of two neighbouring apices I found equal to 0·0050 of a millimetre; this would also be their breadth at the base. Their height seems to be slightly larger. No actual measurement, however, could be obtained, as I did not succeed in getting a clear side view of them. As to the structure of these little cones themselves, it is very difficult to arrive at a satisfactory conclusion, considering the minuteness of the subject. However, in *Pitta moluccensis* and in *Artamia* I observed a system of extremely fine lines running parallel with the long axis of the cones, *i. e.* transverse or vertical to the long axis or surface of the ramus. These lines themselves do not seem to be straight, but irregularly waved. The breadth of each bar I calculated to be less than 0·0006 of a millimetre.

Below this stratum of polygonal prisms or cones lies brownish-yellow pigment, near the middle of the barb; where the layer of pigment is thicker it looks black-brown. This pigment, of course,

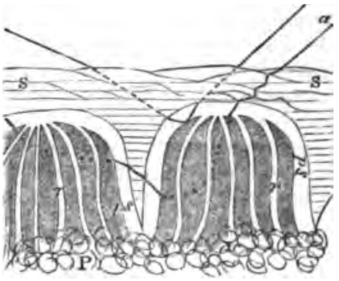
the proper substance of the feather, occupies the rest
hus we have, if proceeding from the surface to the
b; the following structure (fig. 1):—
pparently homogeneous sheath of ceratinine

f prismatic cells; and 3, under this, a brownish

may vary in thickness and in surface-structure from
14 to 0·0043 mm.
a I calculated its thickness to 0·0016 mm., and the surface
ed to be quite smooth; whilst in *Cœreba* each top of a cone
esponded with a slight elevation of the sheath.

The breadth, or diameter, was calculated to about 0·006 mm.; it agrees very closely with that of *Cœreba* and *Ara*.

Fig. 1.



Diagrammatic section through part of a barb of a blue feather.

Fatio, who examined the structure of blue feathers, also says that under the prismatic layer there are "de grandes cellules polygonales à noyau coloré." But I suppose that this is an optical delusion, and that the large polygones (generally hexagones) which we see while looking vertically down upon the surface of the rami are the lateral outlines of the prismatic columns. Therefore what he figured (*op. cit.* plate iii. fig. 6) as polygones are simply the foreshortened columns, and the underlying pigment gives them the appearance of cells with a dark nucleus.

The thickness of the surface-coating of blue feathers varies considerably in different birds, and even in different feathers of the same bird. Differences between 0·0016 and 0·0043 cannot be put down as mistakes of measurement. Again, we know that the thickness of colour-producing plates varies from about 0·00006 to 0·0004 mm., giving bluish-white or pale orange light respectively. And if the plates in question are thicker than about 0·0005 mm., they cease to produce colour, and the law of colours of thin plates is not applicable to them. Now our surface-coating of 0·004 is about ten times thicker than the thickest of colour-producing plates; consequently this surface-coating cannot be the cause of the blue colour. Moreover, we find quite a similar sheath surrounding red and black feathers; and therefore the function of this sheath will be, besides merely protecting the feather, to give the blue colour, produced by other parts, a glossy brilliant appearance. This, however, does not mean that this transparent sheath is superfluous or unimportant to the appearance of blue; since, supposing the blue is produced by the underlying cone-stratum, there must be some material to reflect this blue to our eye, in a similar way that a piece of wood shows its colour up much better when polished or varnished.

We must therefore look for other reasons for the appearance of blue. It is true that all blue feathers contain a yellowish to brown pigment; but the same is the case with many others, like yellow and green feathers, and, besides this, a yellow pigment alone can never produce blue.

The most essential part of blue feathers is the layer of prismatic columns; but as these vary considerably in size, from 0·011 to 0·003, they alone cannot be the essential part, nor can it be the thickness of the transparent coat of the little columns themselves, since even this extremely thin coating is sometimes too thick to allow the application of "thin-plate colours."

As the primary cause, we have to consider the fine ridges which we observe on the outer surface of all these prismatic columns. Many of them are so fine that they are even narrower than the length of one wave of light (the length of one wave of red light being 0·0007, that of violet being 0·0004 mm.). As they form a system of ridges, I am inclined to apply to them the theory of "Gitterfarben," and I explain the blue colour of feathers by this theory.

The colour produced by thin plates depends entirely on the proportion of the thickness of the plate to the length of the waves (w); consequently if this proportion is equal to x, and y is the thickness of the plate when first looking red, this same colour will appear every time when the thickness (y') of the plate has increased to an odd multiple of wx. But after a certain thickness is obtained, the plate loses the power of producing colour. Very similar conditions apply to the theory of colours produced by a system of narrow ridges. However as these ridges in the cones are so minute that a cipher generally does not appear before the fourth decimal, we are unable to measure them with exactness. Moreover these ridges do not appear always as straight lines, but seem to be waved; to measure the length and deviations of these waves would be mere guesswork.

Whether this system of ridges is the only cause of the blue colour is doubtful; very likely the transparent coating and the cones themselves will considerably influence the light passing through them. The production of blue therefore in a feather would be the result of a very complicated process.

Let us throw only a furtive glance at some of the changes which the light falling upon and passing through a blue feather is likely to undergo. First, part of the rays will be simply reflected from the outer surface of S S (fig. 1, p. 413); secondly, the rest, before passing through this stratum, will be variously broken and reflected *before* reaching the coating *ps*, since the stratum SS is not homogeneous, but consists apparently of several irregular scales and secondary strata; thirdly, the coating, *ps*, breaks the rays again and partly reflects them, and, if it is only 0·0006 mm. thick, as in *Pitta*, it is thin enough to allow the application of the theory of thin-plate colours; fourthly, the system of ridges; fifthly, some rays will reach the layer of brownish pigment. How much of them is absorbed, how much reflected as brownish light, and what the changes are of this brown light before it comes up again to the surface, we cannot tell. Again, the ray *a* will be under different conditions to the ray *c*. To follow and to calculate all these changes would be almost a superhuman task. We know only the result, namely blue colour.

By the application of the theory of colours of narrow ridges we are enabled to explain several other colours, fortunately under less difficult circumstances. We have seen before that many yellow feathers owe their colour to a yellow pigment. But several of them do not contain any pigment. The thin rami and radii of the downy part of a feather of *Pitta*, for instance, appear coloured (yellow) only under direct light, but they are colourless if examined under the microscope with transmitted light. Now in yellow feathers, no matter if they contain pigment or not, the surface shows very fine longitudinal ridges, which are more or less parallel to one another, and which appear as straight lines. This I found was the case in the yellow feathers of *Pitta*, *Psittacula*, *Arachnothera*, *Picus*, and *Parus*. The distance between the top of two neighbouring ridges varied from 0·001 to 0·0005 of a millimetre. That there are real ridges on the surface we can see on a transverse section of a yellow radius. The radius of a yellow pectoral tuft-feather of *Arachnothera* (Plate XXVIII. fig. 6) had a diameter of 0·007 mm.; as there were about twelve such ridges, like α, β, γ, their distance could not be greater than $\frac{0{\cdot}007}{12} \cdot \pi = 0{\cdot}0018$ mm. In *Pitta* the radius of a half-downy feather had a diameter of 0·012 mm. All round there were about twelve ridges, and the breadth of one ridge was rather smaller than the interstices; therefore the breadth of one ridge must be smaller than $\frac{12{\cdot}0}{12+12} \cdot \pi = 0{\cdot}0015$ mm. Another method of calculating gave 0·0012 as the breadth of one ridge.

Violet feathers.—Similar ridges exist on the surface-coating of violet metallic feathers, as, for instance, in *Æthopyga* and in *Sturnus*; but the ridges do not appear to be quite straight, moreover they are much finer; in *Sturnus* only 0·00085 mm.

Green feathers.—Only in the Musophagidæ green pigment has been found. All other green feathers contain only either zoofulvin or a black-brown pigment. Krukenberg suggested therefore that the green appearance is the result of a mixture of the yellow-pigment colour and of a blue optical structural colour. However, this cannot well be always the case, since most green feathers do not show that peculiar structure which we invariably meet with in blue feathers.

All the green feathers which I have examined show the following structure:—Generally a transparent smoothly surfaced sheath surrounds the rami and the radii, which are both green. Between this sheath and the invariably present yellowish, brownish, or pinkish pigment one sees a system of ridges and fine pits. These ridges are shorter and less regular than those observed in yellow feathers, and the little pits are rather irregularly dispersed over the shaft and plane of the barbs and barbules. The more regular and parallel these furrows are, the more approaches the green colour to a yellowish tinge. As we know of no green feathers without any pigment, and always with such an irregularly ridged and furrowed surface-structure, we cannot say that this structure directly produces green, nor that it produces blue. We must accept that they break the yellow light, issued from the yellow pigment, into green.

Red feathers are frequently surrounded with a thick transparent sheath, for instance those of *Rhamphastus*; but they have no peculiar or particular surface-structure, and the large wrinkles which we observe in them seem to be merely the result of a drying-up process of the horny feather-substance. In orange or orange-brown feathers, however, we frequently find a dark red pigment and yellow surface-structure.

Explanation of subjective or metallic colours.—We speak of metallic colours if the feathers under reflected light appear with a metallic gloss, and if their glossy colour changes into another one according to the position of our eye. If we look in a direction nearly parallel to the plane of the feather it will appear black. This can be done in two ways (fig. 3, p. 420): first, with our eye between the object and the light, a position which I propose to call A: secondly, with the object between the light and the eye, position C. By passing the eye from A to C, along the line indicated by the arrow, we notice the gradual appearance of all the various metallic colours which the feather is able to display. We further observe that these colours do not appear at random, but, and this is of the greatest importance, that they begin with the colours nearest to the red side of the spectrum, and end with the violet. The position just intermediate between A and C is that in which we look vertically down upon the plane of the feather, with the object turned fully to the light; no matter, however, whether this position is produced by looking at the feather in the way as indicated by diagram B or D. This position we call B.

In order to ascertain this fact, I have examined, under these three positions, about eighty birds of all orders, wherever metallic colours were present, and I did not find one single exception to the rule. With the exception of two particular cases, which I shall explain later on, the metallic parts of all these birds look perfectly black in position A; if we turn the bird to position B it will, let us say, look green; and halfway between B and C this bird will assume a blue colour, which again passes into violet before appearing black again in position C. If the bird begins with bronzy red, it will change through golden green to pure green, then through bluish green to blue and violet. There is not a single feather which, if moved from B to A, changes from green to blue, in other words from the violet to the red end of the spectrum. Thus we are able to predict into which colour a bird can change if we know its colour in position B. Thus a blue feather can only become purple or violet; a green one has more changes, and a golden-green one still more. It is, however, very rare that a feather changes through more than half of the spectrum; a coppery-red feather will generally cease with green; a violet feather cannot change at all, except into black, since beyond the violet there are no visible colours in the spectrum.

Another important fact is that metallic feathers can appear in any colour which is represented in the spectrum, but not in any which, like brown or grey, are not spectral colours. All these circumstances induce me to explain the changeable metallic colours as prismatic; and in order to prove this we have to examine the feathers for their prismatic structure. In any metallic feather the metallic colour is confined to the radii which are entirely devoid of ciliæ, and consist of a series of variously shaped compartments which overlap one another like tiles of a roof.

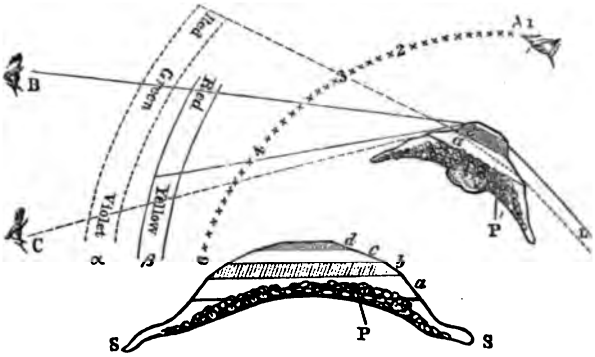
Fig. 1, Plate XXVIII., represents a barbule of a violet feather of *Æthopyga*; it consists of about fifteen compartments, each 0·03 mm. long and 0·03 mm. broad, and each forming a plane. Fig. 9 *a*, Plate XXVII., shows part of a barbule of *Nectarinia famosa*, brilliant green in position B, blue in C, black in A; each compartment was 0·027 mm. long and 0·015 mm. broad. If turned on the edge and looked upon sideways, they look like fig. 9 *b*; each compartment is convex-concave, with the convex side lying uppermost turned towards the light. In Jacamar, coppery red in positions B and A, green in C, they measure 0·040 by 0·018 mm. Every one of these compartments is surrounded by a transparent horny coat, the thickness of which varies from 0·00085 mm. (*Sturnus*) and 0·0015 mm. (Jacamar), 0·0012 (*Æthopyga*) to 0·0022 mm. (*Galbula tombacea*). The surface of this coat is either perfectly smooth and polished, like in *Nectarinia famosa*, or, in violet feathers, contains very fine longitudinal ridges, or, as in Jacamar, it showed very fine and numerous little dots. Below this transparent and apparently colourless sheath lies brownish to black pigment evenly dispersed.

Now, then, let us take a transverse section of such an arrangement (S S being the transparent sheath, P the pigment), and put it in a position that the light falls upon it from L (fig. 2, p. 418). A very small part of the orbit of a circle or any curve may be treated as a straight line; we thus may regard this sheath as consisting of a number of small prisms. We know that a prism in such a position, with the top or one edge directed upwards, breaks the light in such a way as to produce a spectrum on the side furthest from the light, with the red lying at *r* (*i. e.* towards the upright edge of the prism), and with the violet at *v*.

No rays, or at least no visible ones, are thrown out into the space between 1 and 2; consequently with our eye at 1, corresponding to position A, we shall perceive black. At 3 the first red rays will become visible, at 4 the blue ones, and so forth, till at 6 we come across the ultra-violet rays, where we see again black, corresponding with position C. Between 1 and 6 will be a place from where we can look at the object under full light (position B); and this, of course, is the way in which we generally describe an object.

As this agrees with observation, *i. e.* as every metallic feather (if examined in the way explained above) shows precisely the same phenomena as a prism under similar circumstances would show, we have every right to consider the explanation of "metallic varying colours" as proved. There are, however, several *observed fact*

Fig. 2.



Diagrammatic section through the barb of a "metallic" feather.

which need an explanation, since they seem rather to upset thi theory.

First, why does not every metallic feather display all the colour of the spectrum? and why do they generally range not over mor than a few neighbouring colours? Of course any prism, howeve small it be, displays all the colours of the spectrum; but this does not mean that all of them *reach* our eye! Part of the spectrum might be hidden by some other object standing between it and ou eye; for instance we can easily cut off either end of a spectrum by a screen. In the feathers the screen would be represented by neighbouring radius, so that, as, for instance, in fig. 2, the lower hal of the spectrum β may be concealed, in which case that feather would only vary between red and greenish. *Or* two neighbouring prisms, even if they belong to the same radius or barbule, may be so situated that their spectra partly overlap one another. This would have a double result: first, that where two complimentary colours fall upon each other they would simply produce white light; secondly, that through the combination of two different colours, as, for instance, yellow and blue, there would appear a third one, in this instance green. Thus, spectrum *a*, produced by the prism *a*, is partly covered by the spectrum β, produced by prism *b*; the blue of β covers the yellow of a. Now as red and green give white, and blue and yellow give green, we should in this case probably see only the colours red and orange, produced by prism *a*.

Another circumstance, which might make this process very complicated, is implied in the consideration that the surface of the prismatic sheath is frequently uneven. How many different systems of prisms result from this arrangement, and how in the purple feathers of an *Æthopyga* the rays of light become broken by the surface-ridges into blue and violet, we are unable to explain.

A third phenomenon, which needs explanation, is that some of the most gorgeously metallic feathers cannot be made to look black in position A or C. An example of this is the beautiful coppery-red to deep blue of a Jacamar. Under the microscope the compartments of the radii of such a feather are extremely convex, as in fig. 5, Plate XXVIII.; consequently there will be always some part of such a compartment which presents a vertical plane to the eye, and which therefore is always more or less in position B.

Now to sum up. We have to distinguish between several categories of colours in feathers.

1. *Objective chemical colours* directly produced by pigment. To these belong *black*, *brown*, *red*, *orange*, and *yellow*.

2. *Objective structural colours.* The feather may contain no pigment at all, and the colour be produced solely by a special structural arrangement of the feather-substance, for instance *white*, and frequently *yellow*; the latter if the surface is composed of very fine and narrow longitudinal ridges. *Or* the feather contains a yellow to brownish-black pigment, and the colour actually observed, as *green*, *blue*, and *violet*, is produced by a specially produced and particularly constructed transparent layer between the pigment and the surface. Of non-changing colours *blue* and *violet* are always structurally objective. *Green* seems to be only in a few cases the result of yellow pigment combined with blue surface-structure. In most cases it seems to be not a mixture of two colours, but due to yellow-pigment light being broken into green. A green pigment seems to be very exceptional.

3. *Colours which change and which entirely depend on the position of the light and eye.* They are produced by a transparent sheath, which acts like a prism. Any changing colour represented in the solar spectrum may be thus produced in feathers.

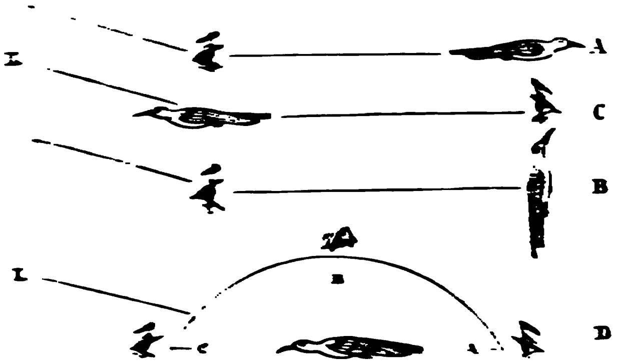
The facts which I have laid down in this communication indicate the desirability, nay even the absolute necessity, of a standard method, not only of describing but also of drawing birds and other animals which show metallic colours. These three standard positions, I venture to submit, should be the following:—

Position A, in which the eye is placed between the bird and the light, the eye and light almost in a level with the planes to be examined.

Position B, in which the bird is placed vertically to the eye, a position in which objects are usually described.

Position C, in which the bird is held in the same level with, but between the eye and light.

Fig. 3.



The three positions in which metallic colours should be observed.

EXPLANATION OF THE PLATES.

Plate XXVII.

Fig. 1. Part of a belly-feather of *Pitta moluccensis*. s, scapus or shaft; r, ramus or barb; o, radius or barbule.
- 2. The blue part of the ramus at r (fig. 1), as seen under the microscope with transmitted light.
- 3. The same, but magnified 640 times. st, transparent surface-coating or stratum; c, the layer of cones, with their sheath (s) and with the fine ridges r.
- 4. The same of *Cotinga*.
- 5. Yellow radius of *Pitta*. pp, pigment-corpuscles, the shaft of the radius showing the longitudinal ridges.
- 6 a. Part of another yellow radius of *Pitta*. No pigment present.
- 6 b. Transverse section through 6 a at a.
- 7. Yellow radius of *Picus*.
- 8. Part of a metallic golden-green to blue feather of *Nectarinia famosa*. s, shaft; o, radius; r, ramus.
- 9 a. Distal half of one radius of *Nectarinia*, showing the transparent sheath which surrounds the compartments.
- 9 b. The same, but seen from the edge.
- 10. End of a metallic radius of a Jacamar. cc, the suppressed ciliæ.
- 11. Part of a metallic violet barbule of *Sturnus vulgaris*.
- 12. Part of a barbule of a red non-metallic feather of *Nectarinia*.

Plate XXVIII.

Fig. 1. One metallic violet barbule of *Æthopyga*.
- 2. One barbule of a green feather of *Palæornis*.
- 3. Barbule of a yellow crest-feather of *Parus sultaneus*.
- 4. Part of a colourless barbule of *Parus sultaneus*.
- 5. One barbule (radius) of a metallic (coppery-red to bluish) feather of a Jacamar. c, one of the compartments separated from the others, and showing its highly convex-concave shape; r, barb or radius.

Fig. 6. Part of a radius of a yellow pectoral tuft-feather of *Arachnothera magna.*
7. A feather of the breast of *Psittacula*, natural size.
8 *a*. Part of a barbule of the red part in the feather of *Psittacula.*
8 *b*. „ „ yellow „ „
8 *c*. „ „ green „ „

May 16, 1882.

Osbert Salvin, Esq., F.R.S., Vice-President, in the Chair.

The following report on the additions to the Society's Menagerie during the month of April 1882 was read by the Secretary:—

The total number of registered additions to the Society's Menagerie during the month of April 1882 was 124, of which 32 were by presentation, 65 by purchase, 18 by birth, 3 in exchange, and 6 were received on deposit. The total number of departures during the same period, by death and removals, was 82.

The most noticeable additions during the month were the following birds, all of species new to the Society's Collection.

1. A Rifle-bird (*Ptilorhis paradisea*), purchased April 4. This is a male bird in immature and worn plumage, changing very slowly into the adult dress, but apparently in good health.

2. A pair of Black-headed Tragopans (*Ceriornis melanocephala*), imported from Calcutta, and received April 5. This is the first pair of this fine species that has reached us, although I believe that several examples of it have been previously received in Europe, and there is said to have been a single example of it many years ago in the Gardens.

3. Four Rüppell's Parrots (*Pœocephalus rueppelli*) from Western Africa, purchased April 15. This species was first described and figured by G. R. Gray in the Society's 'Proceedings' for 1848 (p. 125, Aves, t. 5). Two of our specimens resemble the figure there given; the others have the rump and under tail-coverts blue.

4. A Western Black Cockatoo (*Calyptorhynchus naso*, Gould, B. Austr. v. t. 9), conspicuously differing from the Eastern *C. banksi*, of which we have also examples, in its smaller size.

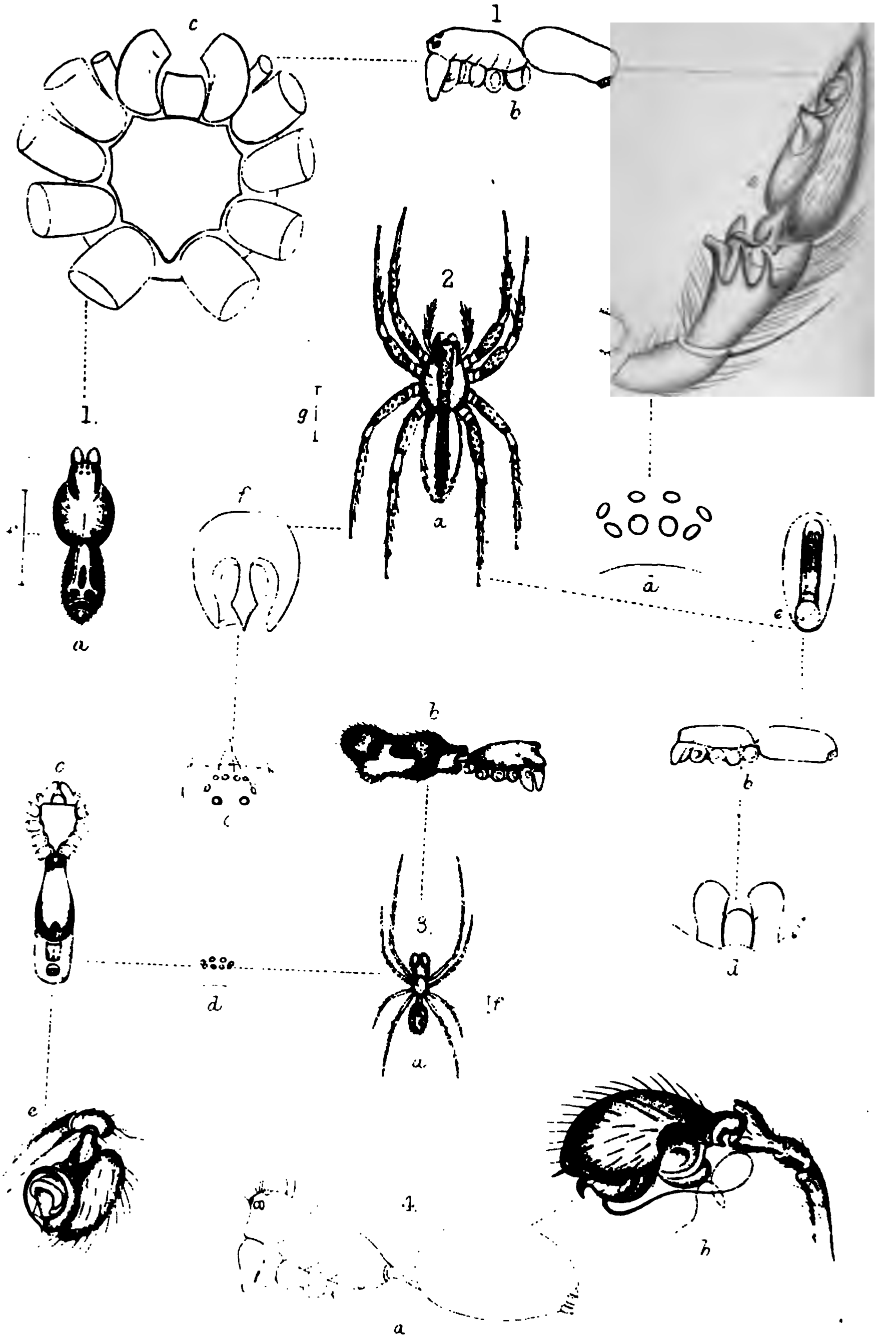
5. A male Cabot's Tragopan (*Ceriornis caboti*), purchased April 18, making a fine addition to the Gallinaceous series.

6. Two of the recently described Green-horned Parrakeet, *Nymphicus uvæensis*, Layard (*suprà*, p. 480, Plate XXVI.), which we believe to be a pair, purchased April 27. These have been placed in the Parrot-house, next to our two living examples of *Nymphicus cornutus* (*cf.* P. Z. S. 1879, p. 550, pl. xliv.), and afford a fine opportunity for the comparison of these two closely allied species.

A mounted specimen of the Dusky Petrel, *Puffinus obscurus* (Gm.), which had been picked up dead in Norfolk in 1858, was placed on the table, having been sent up for exhibition by Mr. Henry Stevenson of Norwich; and the following remarks by him were read:—

"The bird now exhibited was picked up dead by a gamekeeper on

P Z S 1882 Pl XXIX.

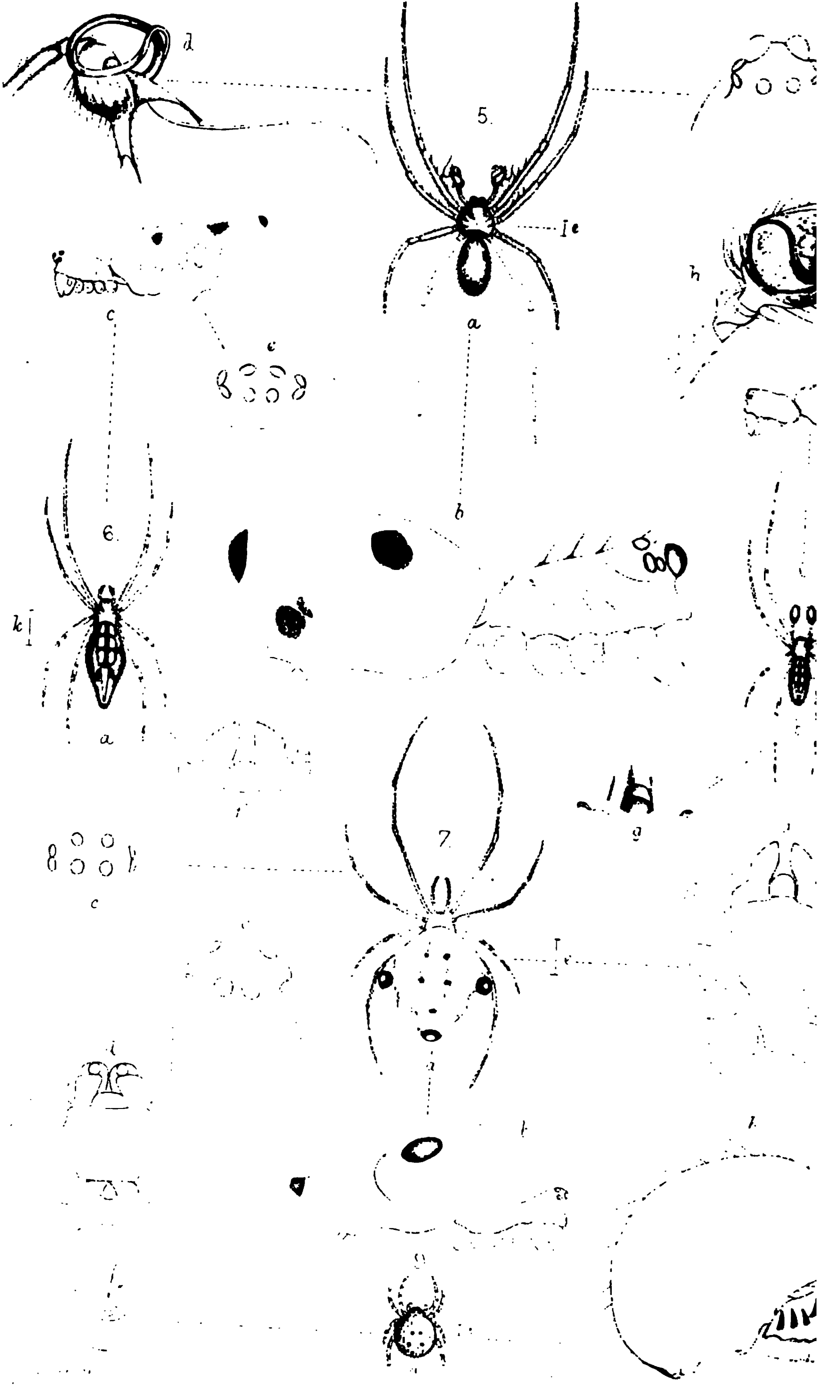


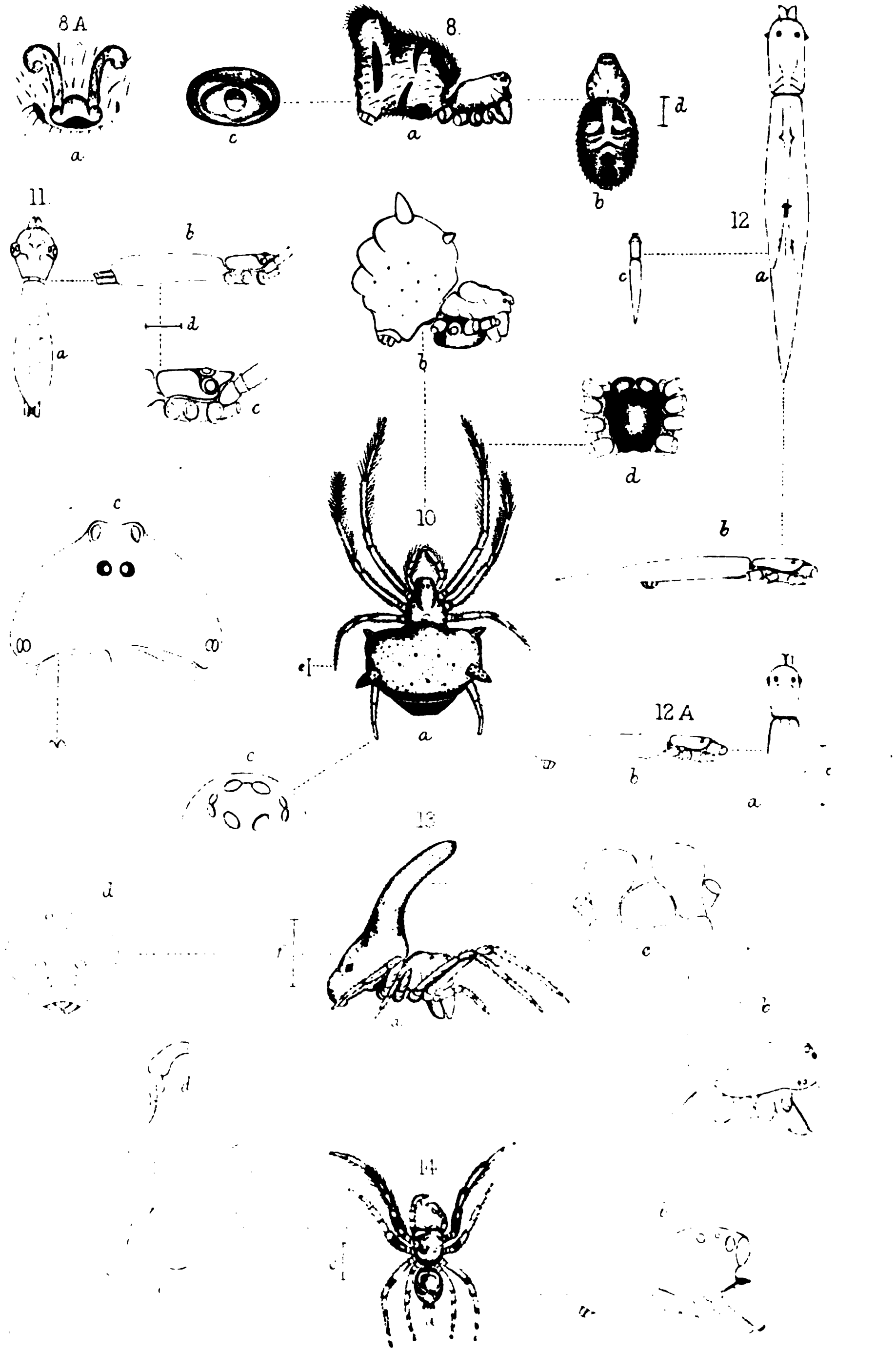
Cambridge del
Carter sc

Mintern Bros imp

New Araneidea.

P. Z. S. 1882





[illegible] Cambridge del.
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Mintern Bros. imp.

New Araneidea

1. On new Genera and Species of Araneidea.

By the Rev. O. P. Cambridge, M.A., C.M.Z.S., &c.

[Received April 29, 1882.]

(Plates XXIX.-XXXI.)

Of the sixteen species of Spiders described on the present occasion, two are from *Caffraria*, sent to me by Mr. Mansel Weale; one from *St. Helena*, received from Mr. Melliss some years ago; two from *Ceylon*, contained in the fine collection made for me by Mr. G. H. K. Thwaites; and the rest (11 species) from a collection made on the *Amazons* by Professor Traill. All are, so far as I am able to ascertain, new to science, excepting the Spider from St. Helena, erroneously included by myself (P. Z. S. 1869, p. 538, pl. xlii. fig. 6) in the genus *Olios*. The example from which the description and figures (*l. c.*) were made was a very misleading one, having been pinned and dried, some important generic parts injured, and its legs extended laterally, in what I find since to be a quite unnatural position. Specimens of this Spider received more recently have convinced me that a new genus of *Drassidæ* must be established for its reception. Eight other new genera are also here characterized, belonging to the families *Drassidæ*, *Theridiidæ*, *Poltidæ*, and *Salticidæ*.

One other point of interest only need be noted here; and that is the discovery, for the first time in South America, of a species of the curious four-eyed genus *Miagrammopes*, Cambr. (*postea*, p. 435. The genus was first characterized from Ceylon (Linn. Soc. Journ. x. p. 398). Since then it has been found at Sydney, N. S. W., Rodriguez, Zanzibar, and now also (2 species) in Caffraria (*postea*, pp. 436, 437).

Fam. DRASSIDÆ.

XEROPIGO, g. n. (nom. propr.).

Cephalothorax broad-oval, truncated in front. The lateral marginal constrictions are strong; and the profile-line forms a tolerably even curve from the upper part of the clypeus to the posterior margin, with a slight dip or depression at the thoracic junction. The height of the clypeus is rather less than half that of the facial space.

Eyes 8, in two curved rows, the convexity of the curve directed backwards; the anterior row shortest; they are of moderate size; those of the fore central pair considerably the largest of the eight.

Legs moderately long, not differing greatly in length, but strong, 4, 1, 2, 3. They are furnished with hairs, bristles, and spines; those beneath the tibiæ and metatarsi of the first and second pairs are disposed in two longitudinal parallel rows, but irregularly disposed on the third and fourth pairs. Beneath the tarsi of the first and second pairs is a not very dense scopula; and the terminal claws are two, apparently not denticulated; and beneath them is a short, dense, compact claw-tuft.

Falces long, powerful, and vertical, with a very strong fang.

Maxillæ strong, curved over the labium, convex on their exterior surface, rounded on their outer sides, obliquely truncated at their extremities on the inner side, and with a strong indentation on their inner side, just above the level of the apex of the labium.

Labium short and somewhat oval; sides curved, and apex slightly hollowed.

Sternum short, oval, truncate before, pointed behind.

Abdomen oblong-oval, somewhat subcylindrical; spinners short, compact, those of the inferior pair strongest.

XEROPIGO TRIDENTIGER, Cambr. (Plate XXIX. fig. 1.)

Olios tridentiger, Cambr. P. Z. S. 1869, p. 538, pl. xlii. fig. 6; and E. Simon, Actes de la Soc. Linnéenne de Bordeaux, vol. xxxiv. ([4] vol. iv.) p. 299.

Length of the adult male 4½ to 6 lines.

The *cephalothorax* is of a dark reddish-brown colour, deepening to black on the caput and falces, and pretty densely clothed with short greyish pubescence.

The *eyes* of the posterior row are nearly equally separated, the interval between those of the hind central pair being perhaps rather the largest. The four central eyes form very nearly a square, and the intervals between those of the anterior row are small, but equal; the fore centrals are much the largest of the eight.

The *legs* are yellow, clothed with greyish-yellow pubescence and other hairs, and the spines are tolerably long and strong.

The *palpi* are rather short, and of a redder yellow-brown than the legs, deepening to dark red-brown on the radial and digital joints. The radial is rather longer than the cubital joint, and is a little produced at its extremity in front, with several somewhat dentiform spines and projections issuing from the extremity of its outer and under sides; three of these are close together on the outer side, two being sharp-pointed and the lower one enlarged and obtuse at its extremity; underneath the joint is the fourth, which is pale-coloured, and furnished with a strong, red-brown, curved (somewhat sinuous) tapering spine, whose point is close to the base, on the outer side of the digital joint. The digital joint is large and of a long-oval form, slightly prominent near the middle on the outer margin. The palpal organs are not very prominent or complex, but have several spines and spiny processes near their fore extremity.

The *falces* have their surface roughened with numerous minute tubercular granulations, and are covered with strong bristly hairs.

The *maxillæ* and *labium* are of a deep blackish red-brown colour; and the *sternum* is of a lighter hue.

The *abdomen* is pretty densely clothed with short hairs of a greyish-yellow and darker hues, and with numerous prominent bristly ones.

Along the middle of the fore half of the upperside is a largish paler yellow-brown somewhat oblong marking, enlarging to its hinder extremity, where it has three divergent points. On the middle of the hinder part of this marking is a longitudinal dark-brown patch; following this, towards the spinners, are several indistinct, curved, pale transverse lines. The underside is pale yellowish brown.

This species was founded upon a Spider received in a dried and pinned state from Mr. T. J. Melliss, by whom it was captured in the island of St. Helena. The legs were set out laterally; and the various structural characters of the Spider presenting a striking agreement with some of the *Thomisidæ* represented by the genus *Olios*, led me at the moment to include it in that genus. Subsequently, however, I received a fine well-conditioned example in spirit of wine, and at once saw that it was not a laterigrade Spider at all, but belonged probably to some unknown genus of *Drassidæ*. This is also confirmed by the opinion of Mons. Simon, to whom I lately sent it for examination, its nearest allies being probably the genus *Clubiona*.

ARACHOSIA, g. n. (nom. propr.).

Cephalothorax oval; lateral marginal constrictions well marked; anterior portion of caput (at the insertion of the falces) truncated in a straight line, the corners being a little prominent; profile-line even and almost level, very slightly highest at the beginning of the posterior slope.

Eyes small, and not greatly different in size, in two transverse rows, of which the anterior (or lower one) is nearly straight, and the posterior very strongly curved; the convexity of the curve directed backwards. The eyes of the lateral pairs are pretty widely separated.

Legs not very long, strong, 4, 3, 1, 2 (3, 1, and 2 being very nearly of equal length), armed with hairs and slender spines; terminal tarsal claws two, with claw-tuft and scopula (not dense) beneath the tarsi and metatarsi.

Falces moderately long and strong, prominent at their base in front, and a little directed forwards.

Maxillæ rather long, straight, sides nearly parallel, rounded on the outer sides at their extremity, and obliquely truncated on the inner sides.

Labium about half the length of the maxillæ, oblong, and rounded at apex.

Sternum oval, pointed behind.

Abdomen elongate-oval, of a somewhat cylindrical form, fitting fairly up to but not over the thorax; at the middle of the underside is a largish transverse curved slit or aperture, leading doubtless to a respiratory apparatus. This aperture is covered with numerous strong hairs. Another fold in the epidermis, a little way in front of the spinners, appears to indicate also an additional aperture of the same nature. Spinners short, compact, those of the inferior pair strongest. This genus is allied to *Anyphæna*.

ARACHOSIA ANYPHÆNOIDES, sp. n. (Plate XXIX. fig. 2.)

Adult female, length 3½ lines.

The colour of the *cephalothorax* (which is thinly clothed with short silky greyish hairs) is brownish yellow, tinged with dull orange. A broad central brown band runs from the eyes to the posterior extremity; and there is a submarginal thoracic line of a deeper red-brown hue.

The *eyes* are seated on small black spots, the outer ones of the anterior row are smallest, and the interval between those of the hind central pair is considerably greater than that between each and the hind lateral next to it. The relative position of the eyes of the anterior row is also nearly similar, and the hind lateral (on each side) about equally separates the hind central and fore lateral eyes.

The *legs* are of a clearer yellow colour than the cephalothorax, speckled with dark red-brown, chiefly on the fore parts and outer sides of the femora. The spines are long and rather slender; beneath the tibiæ of the 1st and 2nd pairs of legs are 4 (in two pairs), and another pair beneath the base of the metatarsi; those on the 3rd and 4th pairs are more numerous and irregularly disposed. The scopula beneath the tarsi and metatarsi is densest on the 1st and 2nd pairs.

The *palpi* are slender and moderately long, yellow, and furnished with numerous long spine-like bristles. Each palpus ends with a small curved claw.

The *maxillæ* and *sternum* are similar in colour to the legs; the *labium* tinged with yellow-brown.

The *abdomen* is of a dull clay-yellowish hue, clothed with short greyish silky hairs on the pale portions. A broad, longitudinal, central dark-brown band (slightly denticulate on its margins towards the hinder part) occupies the upperside, which has also on each side a narrow, lateral, somewhat broken stripe of a similar hue. The underside is also marked with a broad, slightly tapering, central longitudinal brown band, on which are numerous pale strong hairs near the middle, over and around the central spiracular opening (mentioned in the *generic* diagnosis). The genital aperture is rather large, somewhat horseshoe-shaped, and of very characteristic structure.

A single example was contained in Mr. Traill's Amazon collection.

Fam. THERIDIIDÆ.

COLEOSOMA, g. n.

Nearly allied to *Sphecozone*, Cambr., but easily distinguished by the more depressed caput, and especially by the formation of the fore part of the abdomen, which is of a cylindric form, drawn out into a kind of sheath, into which the distinct pedicle uniting the cephalothorax and abdomen is inserted; the cuticle of this sheath runs back a long way beneath the abdomen, and includes the spiracular plates, the openings into the spiracles being thus unusually approximated to the hinder part of the abdomen.

The *cephalothorax* is small, oval, and without lateral marginal constriction at the caput.

Legs moderately long and very slender, furnished with hairs and a very few fine spines, 1, 4, 2, 3.

Eyes very small, rather closely grouped, and placed as in *Neriene*. Clypeus prominent.

Falces rather small, straight and vertical.

Maxillæ strongly inclined to the labium, over which they almost meet at their extremities.

Labium very short, and somewhat rounded at the apex.

COLEOSOMA BLANDUM, sp. n. (Plate XXIX. fig. 3.)

Adult male, length 1 line.

The cephalothorax, falces, maxillæ, labium, and sternum are of a yellow-brown colour, more or less suffused with dusky brown. The profile of the thorax and caput forms a slight curve to the eyes; the height of the clypeus (which is prominent) exceeds half that of the facial space.

The *legs* are pale yellow, a small portion at the posterior extremity of the tibiæ, and at the anterior extremity of the metatarsi, of those of the fourth pair being of a brownish hue.

The *palpi* are of moderate length, and of a dark suffused yellowish-brown colour. The cubital joint is strong, somewhat curved, and obtuse at its fore extremity, near which issues a single sinuous strongish bristle; the radial joint, which is shorter, is articulated to the cubital somewhat sideways, being directed outwards from it, much like that of some species of *Theridion*, and of a broad spreading form at its extremity. The digital joint is large, oval, and with a strong lobe on its inner side; the palpal organs are prominent and complex, with a large, strong, circularly curved tapering spine at their outer side.

The *abdomen* is of a cylindric form, strongly constricted across the upperside near the middle; the peculiar sheath-like form of its anterior extremity has been noticed above; this part is yellow-brown; the rest is nearly black, with a very large, pale, dull yellowish marking on the sides, extending to the underpart. The posterior extremity projects over the spinners, and is obtusely rounded and prominent.

A single example of this very peculiar and delicate little Spider was sent to me, among others, some years ago from Ceylon by Mr. G. H. K. Thwaites. It combines characters of *Neriene, Linyphia, Theridion,* and *Sphecozone.*

Genus SPHECOZONE[1], Cambr.

SPHECOZONE NIGRA, sp. n. (Plate XXIX. fig. 4.)

Adult male, length 1 line.

The whole of the fore part of this Spider is deep brown-black, the falces and the extremities of the legs being rather the brownest; and the abdomen is black.

The general form and structural characters are very similar to those of *S. rubescens*, Cambr., the type of the genus; the Spider, however, is smaller, and differs totally in colours and in the structure of the palpal organs. Several bristly hairs spring from the upperside of the caput, some from the ocular area curving towards and meeting others (stronger ones) curving towards them from the occiput.

The *palpi* are of moderate length; the radial joint is of a somewhat similar cup-shape to that of *S. rubescens*, but not nearly so large or developed; the fore extremity on the upperside is produced and prominent, terminating in a bifid form. The digital joint is large and oval, but rather strongly and irregularly indented on the outer side towards its base. The palpal organs are highly developed, prominent and complex, consisting of several very marked corneous spines and processes; one of the spines is of very great length, black, slender, tortuous and convoluted, ending in a long hair-like point,

Received in Mr. Traill's Amazon collection.

ACHÆA, g. n.

The little Spider on which this genus is based is closely allied to *Theridion*, Walck.; but the large size and prominence of the fore central pair of eyes, as well as the obtusely humped posterior extremity of the abdomen, appear to exclude it from that genus. The eyes also (among other characters) separate it from *Thwaitesia*, Cambr., and *Chrysso*, ejusd.

In the only example examined the legs of the fourth (or posterior) pair were wanting; but from the lengths and proportions of the three other pairs I should judge their relative lengths to be 1, 4, 2, 3. The legs are rather slender and tolerably long, furnished with hairs only, excepting three or four spines beneath the femora of those of the first and second pairs; each tarsus ends with three claws.

Maxillæ and *labium* as in *Theridion*.

Cephalothorax short and broad, with little or no lateral marginal constriction at the caput.

Abdomen short, somewhat cylindric in form, bluntly produced, but not to any great extent, at its posterior extremity on the upperside; probably the female would present this character in a much stronger degree.

ACHÆA INSIGNIS, sp. n. (Plate XXX. fig. 5.)

Adult male, length 1 line.

The whole of the fore part of this Spider is of a clear reddish orange-yellow colour, excepting a large black central spot on the sternum. The sides of the thorax are considerably rounded, and the normal indentations marking off the caput from the thorax are strongly marked. Along the median line of the caput are several bristly hairs directed forwards.

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[1] P. Z. S. 1870, p. 733, pl. xliv. fig. 3.

The *eyes* are very unequal in size for this family; those of the fore central pair are much the larger, and form a line longer than those of the hind central pair, and have their visual axis directed forwards and outwards; these last are rather wider apart than each is from the hind lateral on its side.

The *palpi* are short, the cubital and radial joints exceedingly so. The digital joint is large, and of an abnormal form, somewhat rounded at its base; it has its fore extremity considerably produced into a rather narrow and tapering form; its extremity is furcate, one point of the furcation being longer than the other. The palpal organs are rather complex and highly developed; connected with them is a tortuous, somewhat convoluted, pale-yellowish tapering spine of immense length; and its long slender filiform point extends very prominently outwards. One corneous process of the palpal organs is long, prominent, and tapering, and has its extremity, which projects outwards, notched.

The *abdomen* is of a pale-yellowish luteous hue, thinly clothed with hairs; its upper posterior extremity has a large black spot, on each side of which below (towards the spinners) is another; two others are placed (one on each side) towards the fore part of the upperside; and a sixth is underneath, just in front of the spinners. The spinners are very short and compact.

A single example of this remarkably distinct species was contained in Mr. Traill's Amazon collection.

CHRYSSO, g. n.

Cephalothorax much like that of *Theridion*, small, somewhat depressed, short-oval in form, with very slight lateral marginal constriction at caput.

Eyes as in *Theridion*.

Legs moderately long, slender, 1, 4, 2, 3, furnished with hairs only.

Falces small, not very strong, straight and vertical.

Maxillæ of moderate size, pointed at their inner extremities, and inclined towards the *labium*, which is short and of a somewhat semicircular form.

Abdomen large, the posterior extremity (particularly in the female) produced into a long and tapering continuation, varying, however, in its length in different individuals.

This genus is nearly allied to *Argyrodes*, appearing to form a connecting link between it and *Theridion*.

CHRYSSO ALBOMACULATA, sp. n. (Plate XXX. fig. 6.)

Adult male, length 1½ line; female, 2½ lines.

The whole of the fore part of this pretty little Spider is of an orange-

The *labium* is short, not half the length of the maxillæ, about as broad as long, and rounded at the apex.

The *sternum* is long, and of a triangular form.

The *abdomen* is large and of a quadrate form, being blunt-angular in front, behind, and on each side; the posterior extremity projects beyond the spinners, which (looked at in profile) form another somewhat angular prominence; the anterior portion projects greatly over the cephalothorax. The colour of the abdomen is yellow, generally appearing to fade to a somewhat clayey colour; on the upperside is a broad, more or less broken, longitudinal central white band, with some lateral blotches or patches of the same colour. The lateral and posterior angles are boldly tipped with black, and five brownish or black marks along the middle indicate the normal impressed spots.

The male is smaller than the female, and the abdomen is of a narrower form, the lateral angles being scarcely noticeable; but in colours and markings the sexes are similar. The palpi are short, the radial and cubital joints particularly so; the digital joint is large, and has its extremities on the inner side considerably produced in a pointed form and somewhat bent; the convex sides of the digital joints (as is not unusual in some allied genera) are directed inwards towards each other. The palpal organs are tolerably compact but complex, and, though less developed, not much unlike those of *C. albomaculata*.

Numerous examples of this pretty Spider, but nearly all females, were contained in collections sent to me some years ago by Mr. G. H. K. Thwaites, from Ceylon. The genus is evidently nearly allied to *Euryopis*, Menge.

Genus THWAITESIA, Cambr.

THWAITESIA AFFINIS, sp. n. (Plate XXXI. fig. 8 A.)

Adult female, length 2½ lines.

This Spider is very like *Thwaitesia margaritifera*, Cambr. (the type of the genus, found in Ceylon). The abdomen is of a similar dull luteous-yellowish hue, ornamented with numerous brilliantly shining white, pearly, silvery scale-like blotches; and it also has its posterior extremity produced upwards in a conical form, so that looked at sideways the abdomen is as nearly as possible an equilateral triangle. In the type (from Ceylon) the abdomen is much more produced. The legs are also rather stronger and shorter than in the type, and are armed with fewer distinct spines, while the hairs are stronger and of a more spine-like bristly nature. The colour of the legs is a dull orange, suffused with deep orange-brown at the far extremities of the tibiæ and metatarsi, a small portion of the base of the latter being also similarly suffused.

The ocular area (or rather the space within the eyes) is raised in a more convex form; and the genital aperture is smaller and of a totally different form.

Each tarsus (in both species) ends with a strongish, black, curved pectinated claw.

A single example in Mr. Traill's Amazon collection.

THWAITESIA? DIVERSA, sp. n. (Plate XXXI. fig. 8.)

Adult female, length 2 lines.

This Spider differs in some respects from the type of the genus, but whether sufficiently so to justify the formation of another genus for it appears to be uncertain as yet.

The normal indentations of the cephalothorax are less strong, and the eyes of the posterior row are equidistant from each other, and the height of the clypeus is equal to half that of the facial space; the legs also are shorter and rather stronger, and are furnished with hairs only, but these are strong and of a bristly and even somewhat spinous nature.

The maxillæ are very similar to those of the type; but the labium is distinctly hollowed at the apex.

The cephalothorax, falces, maxillæ, and labium are of a brightish orange-yellow brown hue; and the sternum is of the same colour, with a dusky patch near its fore extremity.

The *legs* are of a paler yellow hue; the fore extremities of the femora and tibiæ, with the genual joints and (more faintly) a portion near the middle of the femora and tibiæ of the first and second pairs, are red-brown, giving the legs an annulated appearance.

The *abdomen* is large, and has its posterior extremity produced into a strong but not very long hump. When looked at in profile, the distance from the spinners to the apex of the hump is rather less than that from the spinners to the fore extremity (on the upperside) of the abdomen. It is thinly clothed with hairs, and is of a pale dull luteous yellowish-brown colour. The posterior extremity of the hump is black; and in other parts along the middle, at the back and on the sides, there are blackish stripes, patches, and markings; one also underneath (between the spinners and the genital aperture) appears to contain a transverse slit, probably the opening into a portion of the breathing-apparatus; if this should prove to be so (of which I could not satisfy myself sufficiently), it would probably be a good reason for its separation into another genus. The genital aperture is nearly round, not large, but placed on a transverse oval area and surrounded outside again with a strong corneous-looking rim. The spinners are short and compact.

A single example in Mr. Traill's Amazon collection.

Subfamily *Phoroncidinæ*.

OGULNIUS, g. n. (nom. propr.).

Cephalothorax abbreviated behind; caput rather raised and produced, the ocular area including the whole of its anterior extremity; clypeus low, considerably less than half that of the facial space.

Eyes unequal in size, the four centrals largest, and forming a large trapezoid whose anterior side is much the shortest; the lateral pairs are placed obliquely on small tubercles, and the eyes of each are contiguous to each other on either side.

Legs projecting laterally from the sternum, moderately strong, short, 4, 1, 2, 3, furnished with hairs only; and each tarsus (so far as I could ascertain) ending with three small curved claws.

Falces small and rather weak.

Maxillæ short, strong, broadest at their extremities, nearly straight.

Labium very short, broad, about half the length of the maxillæ, and slightly rounded at its apex.

Sternum somewhat quadrate in form, as though truncated behind, where it is a little narrower than in front.

Abdomen very large, globular (or, more properly, somewhat hemispherical) and projecting over the cephalothorax so as almost to conceal it when looked at from above and behind. Cuticle not coriaceous, but marked above with four small dark impressed spots in the form of a quadrangle whose anterior side is shortest.

OGULNIUS OBTECTUS, sp. n. (Plate XXX. fig. 9.)

Adult female, length $\frac{1}{24}$ of an inch.

The whole of the fore part of this minute and curious little Spider is of a dull yellow-brown colour. The *cephalothorax* is marked on each side by several short, wedge-shaped, converging dark-brown patches, with another stronger one on each side below the occiput. The interval between the eyes of the hind central pair is much greater than that between each and the hind lateral eye on its side, while the relative positions of the eyes of the anterior are exactly the reverse of those of the posterior row.

The *abdomen* is thinly clothed with short hairs, and is of a uniform somewhat vinous brownish hue. The genital aperture is of simple form, and is almost concealed by the posterior side of the sternum, which presses hard up against it. This part of the sternum has the appearance of being crushed by the operation of the large abdomen continually pressing against it, and so giving it its quadrate form. The pedicle connecting the abdomen and cephalothorax is also placed abnormally high up. The spinners are short and compact, the anterior pair being the strongest.

This genus is allied to *Stegosoma*, Cambr.; but the form of the maxillæ, labium, and sternum distinguishes it at a glance; the shape of this last is very unusual, and gives rise to a quite abnormal laterigrade position of the legs.

Two examples were contained in Mr. Traill's Amazon collection, and are the smallest adult exotic Spiders I have ever yet seen, being scarcely larger than a good-sized pin's head.

TECMESSA, g. n. (nom. propr.)

Allied to *Phoroncidia*, Westw.; but the caput is less drawn out, and is rather gibbous at the top of the posterior slope. Thoracic indentation large and deep.

Eyes unequal in size; the four largest form a large central quadrangle longer than broad, with the lateral pairs near on either side, their eyes respectively placed very slightly if at all obliquely; and the height of the clypeus (which is rather prominent) is less than half that of the facial space.

Legs moderately strong and not very long, 1, 2, 4, 3; the tibiæ of the first and second pairs bent, furnished with hairs and spines; the latter (in the type) numerous, but confined to the tibiæ, metatarsi, and tarsi of the first and second pairs. The tarsi terminate with three claws.

Falces rather short and not very strong.

Maxillæ strongly bent over the *labium*; but both these parts of the structure are so concealed by the unusual prominence of the sternum that they could not be made out quite satisfactorily.

Sternum subtriangular, with the posterior angle strongly truncated, the truncation having the appearance of the ordinary angle bent and flattened back by constant pressure upon that part of the massive abdomen. The sternum is also very convex, so that (when the Spider is seen in profile) it projects rather below the level of the extremities of the maxillæ and falces.

Abdomen large, projecting strongly over the cephalothorax; very convex above and (especially when seen from above) looking very like that of a *Gasteracantha*; the integument is coriaceous and thickly clothed with small sharp-pointed scales, arranged like tiles on a roof; four sharp-pointed tubercular eminences occupy the four corners of the upperside, the posterior pair being the longest and strongest; behind them the surface is marked with strong transverse fold-like indentations, whose position is indicated by each bearing a row of dark points; two other transverse curved rows of dark points (4 and 3) are placed between the two posterior spine-like tubercles above noted. The spinners are short, and contained within a strong, round, sheath-like prominence.

TECMESSA PECTOROSA, sp. n. (Plate XXXI. fig. 10.)

Adult female, length 1 line, breadth of abdomen 1 line (nearly).

The *cephalothorax* is of a dark reddish yellow-brown hue, the falces, maxillæ, and sternum being rather lighter in colour; the legs also are very similar, though, excepting the femora, of a rather paler browner tinge.

The *eyes* are rather indistinct, all, excepting those of the fore central pair, being of an amber-brown hue.

The *legs* have each side of the tarsi and metatarsi, and the inner side of the tibiæ, armed with long strong spines, articulated to small tubercles, divergent and directed forward.

The habit of the Spider is, evidently, to sit with its anterior pairs of legs drawn back, bringing the spinous parts in front of and around the fore part of the caput, the spines appearing thus to protect it with an impregnable cage-like defence; or their purpose may be only to enclose and retain better within the grasp of the falces the Spider's insect prey.

The *palpi* are rather long, and armed in a similar way to the legs.

The *sternum* is one of the most remarkable features in this

Spider; it is not only very prominent (projecting below the basal joints of the legs), but the legs of the 3rd and 4th pairs are set into it in such a way as (when looked at in profile particularly) to show a portion of it between them and the margins of the thorax. The sternum is covered with scales like the abdomen.

The *abdomen* is of a pale dull (though somewhat golden) yellow hue, the four sharp prominences being rather darker; the posterior part and sides are marked with curved transverse rows of small deep red-brown spots or points. The prominence supporting the spinners is dark yellow-brown; and the genital aperture is placed in a large deep-red-brown area. The whole abdomen is covered with scales (as above noted) and also with very minute bristle-like hairs, apparently one to each scale.

A single example of this remarkable Spider was contained in Mr. Traill's Amazon collection.

Family MIAGRAMMOPIDÆ.

Genus MIAGRAMMOPES, Cambr.

MIAGRAMMOPES TRAILLII, sp. n. (Plate XXXI. fig. 11.)

Adult female, length 2¼ lines.

The general form and appearance of this Spider is very similar to that of the typical species from Ceylon (described and figured Journ. Linn. Soc. x. p. 401, pl. xiv.); but its specific characters are very strong, and will serve to distinguish it at a glance from all the few species of the genus yet described.

The *cephalothorax* is short and of a somewhat pentagonal form, much the broadest at the eyes (giving it there an angular appearance), and truncate at its posterior extremity. At the base of the falces it is rounded; and just behind the eyes there is a very strong and deep transverse indentation.

The *eyes* are moderate, and not very unequal in size; they are in two pairs widely separated, each pair placed in the angle at the widest part of the caput. The eyes of each pair respectively are placed on strong black tubercles, and are near to each other, being separated by less than two diameters' interval, and forming a line nearly at right angles to the plane of the cephalothorax.

The *legs* of the first pair are long and strong, issuing from in front on each side just beneath the angle where the eyes are situated, and by their strength appearing to have thrust both the second pair and the palpi out of their normal places. The fourth pair are next in length and strength, but very much less in both respects than those of the first pair. The third pair are the smallest, being somewhat shorter and weaker than those of the second pair. All armature, excepting calamistra on the metatarsi of the fourth pair and the terminal tarsal claws, had been rubbed off the two examples examined. The tarsal claws are 3 ordinary ones with 2 or 3 others, supernumerary and opposed, like those in the genus *Epeira*.

Maxillæ rather long, strong, enlarged and rounded at their extremities.

Labium broad, and considerably bent in, transversely, above its connexion with the sternum; it is about half the length of the maxillæ, and somewhat pointed at the apex.

The *sternum* is heart-shaped, hollowed at the anterior extremity, and with slight eminences opposite to the insertions of the legs.

Abdomen short and broad, but with its anterior portion greatly elevated and produced into a long, slightly tapering, curved projection, which bends forwards over the cephalothorax.

It is probable that this genus is allied to *Mastigosoma*, Auss., and *Cyphagogus*, Günther, as well as to *Poltys*, C. L. Koch.

WIXIA ABDOMINALIS, sp. n. (Plate XXXI. fig. 13.)

Adult female, length 3¼ lines, length of abdomen (from the hinder extremity to the end of the anterior projection) rather over 4½ lines.

The *cephalothorax* and *falces* are yellow-brown; the clypeus, as well as a short, broad, oblique band towards the base of the falces, brown; the extremities of the falces deep brown; the surface of the cephalothorax is covered pretty thickly with short greyish hairs.

The *eyes* of the central group do not differ much in size. Those of the posterior pair are of a pale yellowish pearly colour, and seemed to be rather smaller than the anterior pair, which form, however, a shorter line, being dark-coloured and separated by no more than an eye's diameter.

The *legs* are dull brownish yellow, of a somewhat flattened shape, though not so much flattened as in *Poltys* or *Cærostris*; besides the spines mentioned above, they are clothed with numerous greyish and other hairs. The tarsi are short.

The *palpi* are moderate in length and strength, and similar in colour and armature to the legs; each ends with a curved claw furnished with longish pectinations.

The *maxillæ* and *labium* are dark brown tipped with whitish; and the *sternum* is similar in colour to the legs.

The *abdomen* is of a dull luteous kind of yellow-brown, clouded or suffused with a sooty-brown hue in front of the anterior elevation, of which the apex is bifid, each point ending with a round shining tubercle; on the hinder half of the abdomen are four largish impressed pit-like black spots, followed towards the spinners by two longitudinal converging rows of small diminishing deep-brown spots which look like tubercles; others, of a like nature, are disposed more or less regularly in two rows round the margins. The underside is dark sooty brown; and the genital aperture is large, with a deep red-brown shining tubercular somewhat oval prominence on each side of it. The whole abdomen is clothed with short greyish and other hairs; between the four large impressed spots on the hinder part are some blackish irregular markings.

A single example of this curious Spider was contained in Mr. Traill's Amazon collection, and appears to me to belong to an uncharacterized genus.

Family SALTICIDÆ.

MAGO, g. n.

Cephalothorax as high behind as it is long; the posterior slope curved inwards, but almost perpendicular; profile of upperside of caput slightly convex, and sloping a little forwards. The caput is exceedingly large, absorbing, in fact, almost the whole cephalothorax; looked at from above, its upper surface forms nearly a square; the sides also are perpendicular. Height of clypeus less than the diameter of the fore central eyes.

Ocular area slightly broader than long and equal in breadth before and behind; fore central pair of eyes very large, and of a dull pearl-grey hue; fore laterals in a line with base of fore centrals, and of same colour; posterior pair a little smaller than fore laterals, and as nearly as possible equally divided from them by the minute intermediate eye, which is placed a little inside of their straight line.

Legs moderately long, tolerably strong, 1, 3, 2, 4; first pair much the strongest. Armed with spines, and with a small claw-tuft beneath the terminal tarsal claws.

Falces long, straight, divergent, and directed forwards; denticulations small; fang of moderate length and strength.

Maxillæ long, strong, straight, widened on both sides at the extremities, which are rounded.

Labium long, about two thirds the length of the maxillæ, and narrower at apex than base; apex rounded. The direction of the maxillæ and labium is very nearly perpendicular (or at right angles) to the *sternum*, which is small, nearly round, slightly pointed behind, and truncated in front; the truncation is very gently curved, the convexity of the curve directed backwards.

Abdomen small, short-oval, very convex before, and fitting up pretty closely to the incurved thorax.

This new genus is characterized with great diffidence, and chiefly on account of the form of the cephalothorax, of which the figures (Plate XXXI.) give a fair representation. There is very little difficulty in determining a Spider to be of this family; but to which of the now numerous genera it may belong is often a very difficult point to decide. It is a very questionable addition to our knowledge of this group (which now numbers nearly 1500 species) to establish, as is now constantly being done, new genera often most closely allied, without giving a single figure either of the Spider or its generic characters. No description, however minute and laboured, can possibly, in such cases, compensate for an absence of figures. The eye takes in at a glance distinctive ideas of relative form and proportions from figures, when even the most careful description by itself would fail to give a clear conception of them.

MAGO INTENTA, sp. n. (Plate XXXI. fig. 14.)

Adult male, length 2½ lines.

The *cephalothorax* is deep red-brown behind and on the sides, and strongly suffused with blackish on the upperside of the caput (or ocular area). The occiput, which is paler than the rest, is clothed with greyish hairs, of which some in the centre are quite white; there is also a patch of white hairs behind each of the large fore central eyes, a smaller one almost in a line between the posterior pair of eyes, with a few similar hairs round these last. The thorax has a narrow lateral submarginal band (on each side) of white hairs; and a dense row of similar hairs projects prominently forwards just above the lower margin of the clypeus.

The *legs* are yellow-brown, those of the first pair, excepting the tarsi and metatarsi, much the darkest; the others are obscurely annulated with dark yellow-brown. The spines (on the first two pairs) are 4 (in two pairs) beneath the metatarsi (these are the strongest), and 6 (in three pairs) beneath the tibiæ. On the third and fourth pairs of legs the spines are more numerous, but less strong and more irregularly placed.

The *palpi* are moderately long; the cubital joint is of a clavate form, double the length of the radial, and has some whitish hairs on its anterior surface. The radial joint has a strong, but short, obtuse prominence behind, and a curved, shining, tapering, sharp-pointed apophysis on its outer side. The digital joint is of moderate size (but longer than the cubital), and of an oval form; the palpal organs are simple, not very prominent, and (apparently) closely surrounded with a strong black spine.

The *falces*, *maxillæ*, *labium*, and *sternum* are yellow-brown; the falces are the darkest, and have, at their extremities on the inner side, two short parallel rows of small but distinct denticulations, within which the fang lies when at rest.

The *abdomen* is dark brownish black, varying to deep brown in parts; on the upperside two large, somewhat crescent-shaped paler markings occupy each side of the anterior portion, and are clothed with shining white hairs; these are obliquely crossed at their hinder ends by a similarly clothed pale stripe, thus giving the appearance of a tolerably perfect large white circle occupying the whole fore half of the upperside of the abdomen; the posterior half is marked with several ordinary pale angular bars or chevrons, thickly clothed with whitish hairs. The sides and underside are pale dull yellowish brown, the former obscurely and obliquely marked with dark brown. The spinners are small, but of tolerable and equal length and prominent.

A single example, but in very perfect condition, was received in Mr. Traill's Amazon collection.

List of Spiders described.

Xeropigo (g. n.) *tridentiger*, Cambr., St. Helena, p. 424, Pl. XXIX. fig. 1.
Arachosia (g. n.) *anyphænoides*, sp. n., Amazons, p. 426, Pl. XXIX. fig. 2.
Coleosoma (g. n.) *blandum*, sp. n., Ceylon, p. 427, Pl. XXIX. fig. 3.
Sphecozone nigra, sp. n., Amazons, p. 428, Pl. XXIX. fig. 4.
Achæa (g. n.) *insignis*, sp. n., Amazons, p. 428, Pl. XXX. fig. 5.
Chrysso (g. n.) *albomaculata*, sp. n., Amazons, p. 429, Pl. XXX. fig. 6.
——? *quadrata*, sp. n., Ceylon, p. 430, Pl. XXX. fig. 7.

Thwaitesia diversa, sp. n., Amazons, p. 432, Pl. XXXI. fig. 8.
—— *affinis*, sp. n., Amazons, p. 431, Pl. XXXI. fig. 8A.
Ogulnius (g. n.) *obtectus*, sp. n., Amazons, p. 433, Pl. XXX. fig. 9.
Tecmessa (g. n.) *pectorosa*, sp. n., Amazons, p. 434, Pl. XXXI. fig. 10.
Miagrammopes traillii, sp. n., Amazons, p. 435, Pl. XXXI. fig. 11.
—— *longicauda*, sp. n., Caffraria, p. 436, Pl. XXXI. fig. 12.
—— *brevicauda*, sp. n., Caffraria, p. 437, Pl. XXXI. fig. 12A.
Wixia (g. n.) *abdominalis*, sp. n., Amazons, p. 438, Pl. XXXI. fig. 13.
Mago (g. n.) *intenta*, sp. n., Amazons, p. 439, Pl. XXXI. fig. 14.

EXPLANATION OF PLATES XXIX.-XXXI.

Fig. 1. *Xeropigo tridentiger*, Cambr.

a, Spider without legs or palpi; *b*, ditto in profile; *c*, maxillæ, labium, and sternum; *d*, eyes from in front; *e*, left palpus on outer side; *f*, natural length of Spider.

2. *Arachosia anyphænoides*, sp. n.

a, Spider magnified; *b*, ditto in profile without legs or palpi; *c*, eyes from above and behind; *d*, maxillæ and labium; *e*, underside of abdomen; *f*, genital aperture; *g*, natural length of Spider.

3. *Coleosoma blanda*, sp. n.

a, Spider magnified; *b*, ditto in profile without legs or palpi; *c*, ditto, underside; *d*, eyes from in front; *e*, right palpus on outer side; *f*, natural length of Spider.

4. *Sphecozone nigra*, sp. n.

a, Spider in profile, without legs or palpi; *b*, left palpus, outer side.

5. *Achæa insignis*, sp. n.

a, Spider magnified; *b*, ditto in profile without legs or palpi; *c*, eyes from above and behind; *d*, left palpus, inner side, from below and in front; *e*, natural length of Spider.

6. *Chrysso albomaculata*, sp. n.

a, Spider (♀), enlarged; *b*, ditto (♂); *c*, ditto (♀) in profile; *d*, ditto (♂) in profile; *e*, eyes (♀), from in front; *f*, maxillæ and labium; *g*, genital aperture (♀); *h*, right palpus (♂), from outer side; *k*, natural length of Spider (♀); *m*, ditto (♂).

7. *Chrysso ? quadrata*, sp. n.

a, Spider magnified; *b*, ditto in profile; *c*, eyes, from above and behind; *d*, maxillæ, labium, and sternum; *e*, natural length of Spider.

8. *Thwaitesia diversa*, sp. n.

a, Spider, in profile, without legs or palpi; *b*, ditto, from above; *c*, genital aperture; *d*, natural length of Spider.

8A. *Thwaitesia affinis*, sp. n.

a, genital aperture.

9. *Ogulnius obtectus*, sp. n.

a, Spider magnified; *b*, ditto in profile; *c*, caput and eyes, from in front; *d*, underside of Spider; *e*, natural length of Spider.

10. *Tecmessa pectorosa*, sp. n.

a, Spider magnified; *b*, ditto in profile; *c*, eyes, from above and behind; *d*, maxillæ, labium, and sternum; *e*, natural length of Spider.

11. *Miagrammopes traillii*, sp. n.

a, Spider enlarged, without legs or palpi; *b*, ditto in profile; *c*, cephalothorax of ditto in profile, more enlarged; *d*, natural length of Spider.

12. *Miagrammopes longicauda*, sp. n.

a, Spider enlarged, without legs or palpi; *b*, ditto in profile; *c*, ditto natural size.

12A. *Miagrammopes brevicauda*, sp. n.

a, Spider enlarged, without legs or palpi; *b*, ditto in profile; *c*, natural length of ditto.

Fig. 13. *Wixia abdominalis*, sp. n.

a, Spider in profile, enlarged; *b*, cephalothorax of ditto in profile; *c*, caput and eyes, from in front; *d*, abdomen, from behind; *e*, maxillæ and labium; *f*, natural length of abdomen to extremity of protuberance; *g*, natural length of Spider (from base of falces to just above the spinners).

14. *Mago intenta*, sp. n.

a, Spider enlarged; *b*, ditto in profile; *c*, left palpus; *d*, ditto, from outer side; *e*, natural length of Spider.

2. Note on an Abnormal Specimen of *Pithecia satanas*. By W. A. Forbes, B.A., Prosector to the Society.

[Received April 18, 1882.]

A young male specimen of *Pithecia satanas*, which was lately forwarded to the Society's Gardens, and died shortly after its arrival, presented an abnormal condition that is perhaps worth recording in the Society's 'Proceedings.'

The peculiarity consists in the completely "webbed" condition of the third and fourth digits of the manus on each side, these two fingers being completely connected together down to their tips by a fold of nude skin, and with their nails closely apposed, though not connected, along their contiguous margins. The other digits of the hands, as well as all of those of the feet, are quite normal, the webbing of them not extending beyond the middle of the first phalanx.

The case is interesting, partly as affording an excellent instance of an abnormal condition affecting homologous parts of opposite sides in an exactly similar way, and partly as showing that the lower Primates are subject, occasionally, to a condition of things which, as is well known, also occurs not at all rarely in Man.

3. On some Points in the Anatomy of the Todies (*Todidæ*), and on the Affinities of that Group. By W. A. Forbes, B.A., Prosector to the Society.

[Received May 15, 1882.]

One of the few important forms of birds that the late Prof. Garrod had not an opportunity, at some time or other, of dissecting was the genus *Todus*, the sole representative of the family Todidæ. I was therefore much gratified at being able to examine, some months ago, a spirit-specimen of *Todus viridis*, which was placed at my disposal for dissection by Prof. Newton with his accustomed liberality; but I hesitated to publish my notes without having further material to confirm my observations. An opportunity of doing this has lately been afforded to me by the kindness of Prof. Baird and the authorities of the Smithsonian Institution in Washington, who forwarded to me, with other valuable specimens, four examples in spirit of the Tody of San Domingo (*Todus dominicensis*). It is on the examination of these two species that the following paper is based.

Dr. Murie has given us, in his article on *Todus*,[1] an exhaustive account of the opinions held by previous writers as to the position of the Todies, as well as a valuable description of their osteology, and reference to what was known of their visceral anatomy. To this paper I therefore refer any reader interested in the literary history of the group in question. Since its publication Sundevall, Garrod, and Sclater have all treated of the classification of birds.

The Swedish ornithologist[2], relying as usual solely upon external characters, was misled into placing *Todus* amongst the Passeres, in the close vicinity of the Tyrannidæ and Pipridæ, though in the same year Mr. Sclater pointed out[3] the impropriety of such a position.

Garrod at first[4] made the *Todinæ* with doubt a subfamily of the Coraciidæ, the *Momotinæ* forming another; but subsequently, on discovering that the Momotidæ lacked colic cæca[5], removed the latter altogether from the group of Passeriformes, and, adopting the opinion of Murie, Sclater, and others as to the close affinities of *Todus* to the Motmots, included the Todidæ with them, the two "almost certainly forming a single family." Mr. Sclater, in his lately published opinions on the classification of birds[6], maintains his earlier view, the Todidæ being placed nearest the Momotidæ. My better opportunities for observation do not allow me to fall in with the opinion of the last two distinguished naturalists. Reserving for the present comparison, I append my notes on the dissection of the two species of *Todus* I have examined.

The tongue is elongated, about ·75 inch long, flat and thin, nearly parallel-sided, though slightly tapering apically, and of horny consistence for most of its length. The root of the tongue, which is more fleshy, has some small spines developed along its base and for a short distance along the lateral margins. These margins anterior to this are frayed-out or ciliated, the direction of the laminæ so produced being backwards; the tip itself is quite entire. There is no crop; the proventriculus is, as usual, zonary; and the stomach (containing insects and seeds in the specimen examined) is a fairly muscular gizzard, lined by hard epithelium. The right lobe of the liver is much larger than the left. The intestines are remarkably short, their total length not exceeding 3¼ inches. The cæca are well-developed[7], and large for the size of the bird, measuring about one third of an inch. Their shape is that constantly met with in all the non-Passerine Anomalogonatous birds possessing cæca—narrowed towards their insertion, and dilated apically. There are two carotid arteries.

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[1] "On the skeleton of *Todus*, with remarks as to its allies," P. Z. S. 1872, pp. 664–680, pl. lv.

[2] 'Tentamen,' p. 60: Stockholm, 1872.

[3] Ibis, 1872, p. 179.

[4] Coll. Papers, p. 216.

[5] *L. c.* p. 427. The contrary had been asserted by Blyth and Murie.

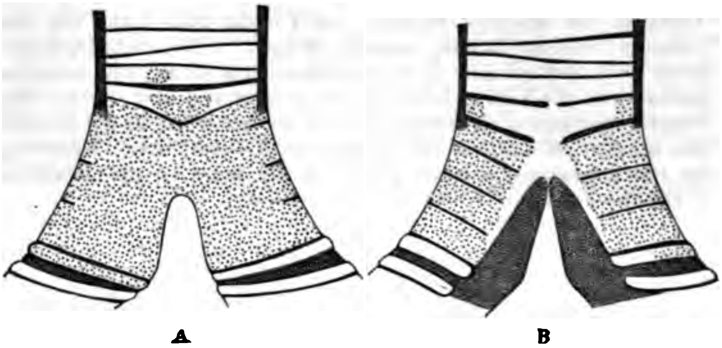
[6] Ibis, 1880, p. 401.

[7] They are erroneously stated by Duvernoy (Anat. Comp. Cuv. iv. [2] p. 284) to be absent.

In the leg, the ambiens and accessory femoro-caudal muscles are absent, as are the gluteus quintus and primus. The femoro-caudal, semitendinosus, and accessory semitendinosus are all well developed. The myological formula is thus —A. XY. The obturator internus is triangular. The deep plantar flexor tendons of the toes blend about three quarters down the leg, the slip to the hallux being given off from the inner of the two tendons a little before it joins the other one.

The pectoralis secundus extends nearly to the end of the sternum. There is no third pectoral, nor biceps slip to the patagium. The *expansor secundariorum* muscle, on the other hand, is well developed, the long thin tendon ceasing on the axillary margin of the *teres* muscle in a way hitherto only known in some of the Gallinaceæ[1]. I find, however, that exactly the same condition occurs in *Momotus* (*lessoni*) and *Hylomanes* (*gularis*), in some of the Alcedinidæ (e. g. *Tanysiptera*, *Syma*, and *Cittura*), as also in *Steatornis*. The presence of this muscle at all in these groups of birds was, I may remark, hitherto unknown[2]. The *tensor patagii brevis* at its termination has an arrangement almost identical with that of the Momotidæ[3], only differing from it in the absence of the thin slip of fascia which is continued, in them, from the recurrent "passeriniform" tendon to the fascia covering the ulnar side of the forearm. The deltoid has no special tendinous slip of origin from the scapula.

Fig. 1.



Syrinx of *Todus*: A, from before; B, from behind.

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[1] *Cf.* Garrod, Coll. Papers, p. 324.

[2] Besides the Coraciidæ, the existence in which of this muscle was pointed out by Garrod (Coll. Papers, p. 324), it exists also of the same "ciconiiform" shape in the Meropidæ, *Leptosoma* (P. Z. S. 1880, p. 470), and, as already noted in MS. by Garrod, in the Galbulidæ. It is absent in all (? Bucconidæ) the other families of Anomalogonatæ.

[3] *Cf.* Garrod, loc. cit. p. 359.

The triceps is Y-shaped at its scapular origin, and receives no tendinous slip from the humerus.

The construction of the syrinx may be best understood from an inspection of the accompanying figures (p. 444), representing the anterior (A) and posterior (B) views of that of *Todus dominicensis*. The trachea terminates below in an ossified bony box, formed of three or four modified rings (probably bronchial) fused together, as is very evident in the posterior view: as may also be seen there, the two preceding tracheal rings are coossified with this box in the middle line posteriorly, though in front they are quite free from it. The box is deeply notched in front, a narrow pessular bar running backwards from the apex of the notch, forming a three-way piece. The bronchial semirings succeeding the box have the normal character. The lateral muscle of the trachea continues downwards to terminate just on the upper limits of this syringeal box. The syrinx of *Todus viridis* is constructed on exactly the same plan.

Comparing these figures with those of *Momotus lessoni* given by Garrod[1], it will be seen that *Todus* differs from *Momotus* in its syringeal box being deeply notched anteriorly, and much more perfect posteriorly, the two parts being united by a pessular bar unrepresented in *Momotus*. In fact it resembles that of the Alcedinidæ or Galbulidæ rather than that of the Momotidæ. The chief difference from the former is that in the Alcedinidæ the intrinsic muscle, often very broad, passes down over the syringeal box to be inserted on one or more of the movable bronchial semirings, instead of ceasing before doing so, as in *Todus*. In *Galbula* there is a bony box nearly similar to that of *Todus*, but with its sides more strongly concave below, and produced downwards anteriorly into strongly projecting points; the lateral muscle only passes on to the *lower* margin of the box, thus stopping short, as in *Todus* and *Momotus*, of the movable bronchial semirings.

As regards the pterylosis, there is a strange oversight on the part of Nitzsch[2] and Murie[3] as to the condition of the oil-gland, both these observers stating it to be nude. In fact it is, in all the four species of the genus, provided with a very well developed, and even long, tuft of plumes, therein completely differing from that of the Momotidæ, in which the tuft is either altogether absent or quite rudimentary[4]. In both *T. viridis* and *T. dominicensis* I count twenty remiges, ten being secondaries; Nitzsch and Murie give nine, having apparently failed to observe the most proximal, smallest one. Nitzsch's figure of the pterylosis in *Todus*, having nearly certainly been constructed from an examination of the skins only, is not quite accurate—it making the outer pectoral branch to the inferior tract too markedly divergent, and not showing the weaker lines of contour-feathers that run from its apex to the hypopterum. The connexion between the dilated part of the main pectoral tract as it passes on to the breast and the patagial feathering is also made unduly important in his figure, this connexion in reality consisting only of some slight, scattered, irregularly-placed contour-feathers lying outside the main tract on the surface of the breast, between that tract and the patagial one.

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[1] *L. c.* p. 428.

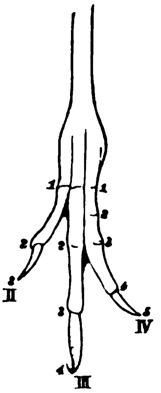
[2] 'Pterylography,' Ray Soc. ed. p. 88.

[3] *L. c.* p. 679.

[4] *Cf.* Garrod, *l. c.* p. 427.

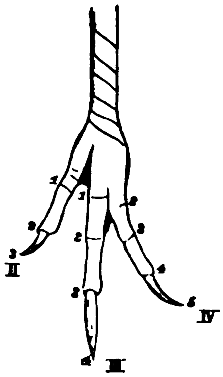
Concerning the external characters of *Todus*, I may remark that the structure of the foot, when carefully compared with that of the Momotidæ, presents considerable differences. In the first place, the long tarso-metatarse, instead of being covered by distinct transverse scutes anteriorly, and by two or more series of smaller scutellæ behind, is "ocreate," being invested anteriorly by a single long scute, without any traces of division; this spreads round both external and internal aspects of the leg, leaving behind a narrow margin of naked skin, with some indication of scutellation. The feet (fig. 2) are much more syndactylous than they are in the Momotidæ. The second digit is united to the third *beyond* the first phalanx of each, and the third to the fourth *beyond* the second joint of the third. In *Momotus* and its allies (vide fig. 3) the union between the second and third digits only extends for about the basal half of their first phalanges, and that of the third and fourth for about half the second phalanx of the former. The feet of *Todus* resemble rather those of the Kingfishers, though the syndactylism has advanced further than in these birds. The position of the hallux is quite normal, it being directed altogether backwards, *not* largely inwards, as imagined by Dr. Murie. The nostrils have a well-defined circular aperture; they lie, unconcealed by the frontal plumes, close to the culmen. Behind them, and extending back as far as the gape, is a well-developed series of rictal vibrissæ, directed downwards and forwards. Another smaller patch of similar vibrissæ, but directed *upwards*, springs, as in *Steatornis*, from the interramal skin of the lower jaw just behind the mandibular symphysis.

Fig. 2.



Foot of *Todus dominicensis*.

Fig. 3.



Foot of *Momotus lessoni*.

Dr. Murie has so elaborately described the osteology of *Todus viridis* that I have not much to add to his account.

In the two skeletons of that species which I possess the manubrium sterni is distinctly bifurcated, therein departing from the Momotidæ and reminding one of the Passeres, and of *Merops*, *Harpactes*, &c.

Careful examination of the skull of that species, as well as of one of *Todus dominicensis*, has shown me that the lower edge of the nasal septum is, for its entire extent, free from the inner edges of the maxillo-palatine plates, a narrow fissure existing on each side between it and them, along which it is possible, with care, to pass the blade of a fine scalpel. In the Motmots (of which I have examined skulls of the genera *Momotus*, *Baryphthengus*, and *Hylomanes*) the maxillo-palatines, though apposed to each other in the middle line, do not actually ankylose for the greater part of their length; so that if the skull be cut across transversely behind the line of union, and the maxillo-palatines with their connected bones separated from the rest of the skull, the two lateral halves of the separated portion fall asunder naturally, there being no union either between the maxillo-palatines themselves (for the greater part of their extent) or between them and the nasal septum, which here does not appear at all in the roof of the mouth in this region. In the Todies, though the septum thus appears, the maxillo-palatines are free altogether both from it and from one another, apparently for their whole extent[1]. If this is so, the Todies are not "*Desmognathæ*," and, inasmuch as they lack the vomer altogether, cannot be included in any other of Prof. Huxley's primary groups of Carinatæ at all!

The vertebræ number 35, exclusive of the pygostyle, as already correctly stated by Murie. Of these I reckon 15 as cervical, 5 dorsal, 8 sacral, and 7 caudal[2].

The close relationship of the Todidæ to the Momotidæ having been so often urged by some of our best naturalists, it will be desirable to point out succinctly some of the important points of difference between them.

The Todidæ, then, differ from the Momotidæ,

(1) In the non-union of the maxillo-palatines, these being attached in the Motmots by harmonic suture.

(2) In the lower margin of the nasal septum appearing in the roof of the mouth between the free edges of the maxillo-palatines. In the Motmots the nasal septum—which ankyloses with the maxillo-palatines anteriorly—does not appear in the palate.

(3) In the complete absence of a vomer, always represented in the Momotidæ by a small, but distinct, ossicle.

(4) In possessing a well-developed lacrymal, quite absent (or early ankylosed with the frontals) in the Motmots.

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[1] It is impossible to state for certain how far anteriorly the maxillæ extend, from a study of the adult skull only; but in *Todus* the osseous roof of the mouth is incomplete as far forwards as the anterior end of the unusually large nares, so that probably it is only by the union of the dentary plates of the præmaxillæ that it is completely ossified here.

[2] Defining as "dorsal" all those, whether ankylosed to the sacrum or not, that bear ribs united directly or indirectly with the sternum. Those that precede, whether or not bearing ribs, are "cervical;" those that follow, and are ankylosed together, are "sacral," the remainder being "caudal."

(5) In the very slight development of the ascending plates of the palatines, well represented in the other group.

(6) In the small amount of ossification in the interorbital septum, this, in the Motmots, being nearly entirely osseous.

(7) In the shape of the sternum, this having four distinct and deep notches (the outer pair being far the larger) never converted into foramina, and separated by delicate xiphoid processes. In the Motmots the inner pair at least (*Hylomanes*), but usually both (*Momotus*, *Baryphthengus*, *Eumomota*) are converted into smallish foramina.

(8) In the tendency to bifurcation of the manubrium sterni.

(9) In possessing 8 sacral and 7 caudal vertebræ, as opposed to 11 and 6 in the Momotidæ[1].

(10) In the oil-gland having a large tuft of plumes on its apex, this being quite or almost altogether absent in the Momotidæ.

(11) In the better development of the rictal and mandibular vibrissæ.

(12) In the ocreate tarsus, which is very long, whereas in the Momotidæ it is transversely scutellated and short.

(13) In the much greater syndactylism of the toes.

(14) In the less development of the outer pectoral branch of the inferior tract, which, in *Momotus* at least, is given off much nearer the anterior margin of the breast, and diverges much more than in *Todus*.

(15) In the shape of the tongue in the Motmots, apically frayed-out and brush-like, and with the lacerations of the margin directed forwards, not *backwards*.

(16) In the possession of large and well-developed intestinal cæca, these being *completely absent* in all the Motmots.

(17) In the triangular shape of the obturator internus, this in the Motmots being oval.

(18) In the conformation of the syrinx.

Of special points of resemblance between Todies and Motmots I am unaware of any that can be considered characteristic of these two families as a group, the points in which they do approach each other being equally met with in other allied birds. Thus the simple dorsal tract of *Todus* and *Momotus* reappears in *Alcedo*, as do the crenulated beak-margins in *Merops*[2]. Neither is the termination of the *expansor secundariorum* muscle on the *teres* peculiar to the two groups in question, as it is found, as already observed, in some Kingfishers, as well as in *Steatornis*.

The resemblance between the termination of the *tensor patagii* tendons in the two families is perhaps the best-marked feature of

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[1] In all the Momotidæ I have examined (including the genera *Momotus*, *Baryphthengus*, and *Hylomanes*) this is the number of these vertebræ, the total being 37, except *Baryphthengus*, which has only 36, by the reduction of its dorsal vertebræ to 4 (C. 15, D. 4, S. 11, Cd. 6=36). Dr. Murie, after stating the number of the vertebræ in the Motmots to be 36, 37, or 38, curiously enough gives the number characteristic of *Todus* (35) as one of the characters of his group "Serratirostres," in which he includes the Motmots (Ibis, 1872, p. 410)!

[2] As already pointed out by Murie, Ibis, 1872, p. 398.

tanea) in female plumage or non-nuptial dress, but which at the time of writing I believed to be *Anas gibberifrons*. I added that we had obtained several pairs out of the lot, and that we expected that some of them would breed with us that year.

They did not breed with us in 1880 nor in 1881, although we had six pairs established in various parts; but this year we have been more fortunate. The pair of these birds placed in what we call the "Waders' Pond" nested the end of March last, and hatched out four nice young birds on the 21st ult., which are still all alive and thriving.

There is no longer any doubt therefore that we have here to deal with a species which, however much it may resemble the female of *Anas castanea*, is quite distinct, and of which the sexes, as may be proved by the examination of our breeding birds, are very nearly alike, the female being merely slightly smaller in size and duller in plumage. It is, in fact, the species described in the 'Ibis' for 1869 by Dr. Buller, from New-Zealand specimens, as *Anas gracilis*, but subsequently identified by Dr. Finsch (Ibis, 1869, p. 380) with *Anas gibberifrons*, S. Müller[1].

As regards the synonyms of this species, after the positive statement of Dr. Finsch and Prof. Schlegel, I think we can hardly accept Prof. Hutton's unsupported opinion that "*A. gracilis* is distinct from *A. gibberifrons*"[2]; and I shall therefore insert our birds in the next edition of the Catalogue of Vertebrates as *Anas gibberifrons*.

The following, if this view is correct, are the principal references to this species.

ANAS GIBBERIFRONS. (Plate XXXIII.)

Anas (*Mareca*) *gibberifrons*, Müll. Nat. Gesch. Land- en Volkenk. p. 159 (1841).

Anas gibberifrons, Schl. Mus. d. P. B. *Anseres*, p. 58 (1866).

Anas gracilis, Buller, Ibis, 1869, p. 41.

Anas (*Querquedula*) *gibberifrons*, Finsch, Ibis, 1869, p. 380.

Mareca gibberifrons, Walden, Trans. Zool. Soc. viii. p. 102 (1872); Ibis, 1873, p. 321.

Mareca albogularis, Hume, Str. Feath. 1873, p. 303.

Querquedula gibberifrons, Buller, B. of N. Z. p. 251 (1873).

Anas gracilis, Hutton, Trans. N.-Zeal. Inst. xii. p. 271 (1880).

Anas gibberifrons, Scl. P. Z. S. 1880, p. 519.

Anas gibberifrons, Ramsay, Proc. Linn. Soc. N. S. W. iii. p. 38.

To the localities given by Finsch (*l. s. c.*) may be added Andamans (*Ball* and *Ramsay*).

Five pairs of this Duck are still living in the Society's Gardens, besides two odd ones, believed to be females. Five of them died in

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[1] First discovered by Salomon Müller in Timor, and originally described by him in a footnote to his volume on the "Land- en-Volkenkunde" of the Dutch Colonial possessions as *Anas* (*Mareca*) *gibberifrons*.

[2] In his article on *Anas gracilis*, Buller. Trans. N.-Zeal. Inst. xii. p. 271 (1879).

1879 (on Sept. 24, Oct. 10, Oct. 11, Oct. 20, and Nov. 17, and one in 1880, Jan. 30); singularly enough, all these on dissection turned out to be males. The skin of one of them only was in sufficiently good condition to be worth preservation. I now exhibit it, and a drawing (Plate XXXIII.) taken from it by Mr. Smit.

I also exhibit the trachea of four of these individuals, showing a distinct *bulla ossea*, as is usual in the males of the Anatidæ[1].

Having been in error myself as to my first identification of these Ducks, I fear I have also led Prof. Newton into an error upon the same subject.

In January 1871 I furnished Prof. Newton with what I believed to be specimens (in the flesh) of a male and female *Anas castanea* that had recently died in the Society's Gardens[2]. Prof. Newton, trusting to Mr. Baker's determination that the *presumed* female was really of that sex, read a paper upon these birds before this Society in November of that year, in which he pointed out that the *presumed* female possessed the extraordinary peculiarity of having a *bulla ossea*, hitherto only known to occur in the male sex of the Anatidæ, and proposed in consequence the new generic term *Virago* for *Anas castanea*[3]. But Prof. Newton having been kind enough to send me up the skins of this presumed pair of birds for examination, I think I may say that there is little doubt that Mr. Baker must have made an error in his determination of the sex of the supposed female, and that that bird is in all probability a male of *Anas gibberifrons*.

This hypothesis is rendered more probable by the existence of the marked difference in the sternum between the two birds which Prof. Newton has pointed out, and by the fact that Mr. Ramsay tells us (Proc. Linn. Soc. N. S. W. iii. p. 154) that he has examined six females of *Anas castanea* without finding any trace of the *bulla ossea*. I fear therefore that the proposed generic term "*Virago*" will not stand.

I have not ascertained female specimens of *Anas castanea*, and cannot, therefore, say how that sex differs in plumage from *A. gibberifrons*. But it will be at once seen on comparison that there is a considerable difference in the bills of the two species, that of *A. castanea* being considerably longer and larger than that of *A. gibberifrons*, and that the presumed female of *A. castanea* (the type of *Virago*) agrees in this respect as well as in every other point with the male of *A. gibberifrons*.

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[1] The trachea is very similar to that figured by Prof. Newton, P. Z. S. 1871, p. 650, fig. 4.

[2] The male was purchased June 15, 1870, and died Jan. 9, 1871; the *presumed* female arrived May 11, 1865, and died Jan. 7, 1871.

[3] See P. Z. S. 1871, p. 650.

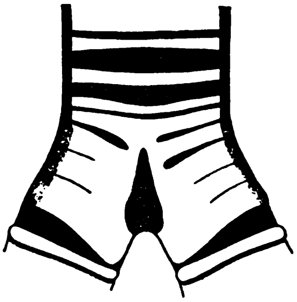
6. Note on some Points in the Anatomy of an Australian Duck (*Biziura lobata*). By W. A. Forbes, B.A., Prosector to the Society.

[Received May 16, 1882.]

Two male specimens of *Biziura lobata*, the first the Society has received, were purchased of a dealer in February last; both were in very weak condition when received, and, unfortunately not recovering, did not long survive. The trachea of this bird being, so far as I know, unknown, I take this opportunity of describing it, as well as of adding some notes on other points of its structure.

The trachea is of nearly uniform calibre throughout, with no dilatation anywhere in its course; below it is perhaps a little narrowed as it approaches the bronchi, but in no degree laterally compressed, as it is, e. g., in such genera as *Anser* or *Cereopsis*. There is no syringeal *bulla* formed at its thoracic end, there being merely, as will be seen from the annexed drawing (fig. 1), a simple ossified box, notched in front and behind, and with a narrow pessular bar below. This is formed by the few last tracheal and early bronchial rings co-ossified together, though not equally so on each side, or before and behind. The four or five preceding tracheal rings differ from those higher up the tube in being narrower and of more uniform breadth throughout, not being notched and incompletely ossified in the middle line, both before and behind, as these are. The bronchi are quite normal in structure, being non-dilated, and with partly ossified semi-rings of the ordinary form.

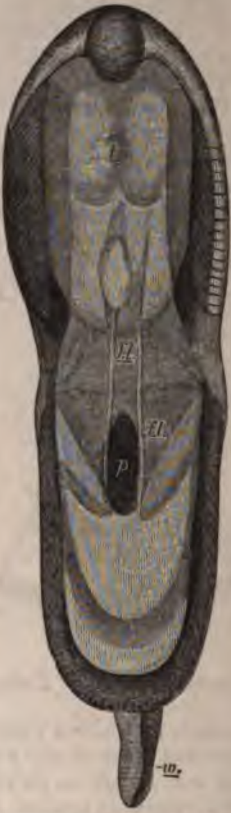
Fig. 1.



Lower part of the trachea of *Biziura lobata.*

In the non-development of a *bulla*, whether osseous or partly membranous, and in the perfectly simple character of its trachea, *Biziura* differs from all the forms of ordinary Ducks known to me, all the genera of these that have been as yet examined exhibiting, in the male sex, either one or other of (or, more rarely, both) these peculiarities. The condition of the male *Biziura* is nearly identical wit that found in the females of other Ducks. Very probably it may b that characteristic of all the *Erismaturinæ*, of which, however, onl *Erismatura rubida* has, so far as I know, been examined as regard this point. In that species the syrinx, judging from Macgillivray'

Fig. 2.



Mouth of *Baziura lobata.*

description[1], is quite similar to that of *Biziura*, there being n *tympanum* whatever, but simply a long box formed of several rin united.

The examination of these two specimens has revealed a feature i them very unexpected in Ducks, and only comparable with th found in certain Bustards. This is the possession of a small, b distinct, *subgular pouch*, formed, as in the males of *Otis tarda*, b the duplicature of the *frænum linguæ*[1]. On opening the mouth, the tongue being forced up against the roof of the mouth as is depicted in fig. 2, there is seen at its base, some way behind the level of the basihyal, a small circular aperture, about the size of a pea, lying between the two folds of the *frænum*, the left of which is much stronger and better developed than the right. This aperture is the mouth of a small pouch, almost large enough to receive the end of the little finger, which extends backwards for some little distance to the base of the tongue, its breadth being nearly as great as that of that organ. This pouch is lined by mucous membrane of similar character to that found over the adjacent parts of the mouth; its anterior limit extends forwards as far as the posterior end of the curious wattle attached to the lower jaw; but there is no connexion between the two, the wattle being merely formed by a fold of the integuments, with no cavity contained in it.

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[1] Audubon, Orn. Biography, iv. p. 331.

The observations hitherto made on the habits of *Biziura* in its native state fail to throw any light on the use or *raison d'être* of this curious structure, though, judging from analogy, it is nearly certain that it is in some way connected with display during sexual excitement, and therefore confined, as we know the wattle is, to the male sex. The first specimen I examined had, I may remark, the pouch less developed than in the second one, probably an older bird. It is not improbable that further observations may show that, in thoroughly adult and breeding birds, this pouch acquires much greater dimensions than was the case in these two specimens.

As regards other points, *Biziura* is in most of its features thoroughly Anatine. The tongue is quite duck-like, though very broad. There is a well-developed penis of the peculiar type found in other Anatidæ. The number of remiges is 28, of which ten are, as usual, primaries. The pollex bears a small claw. There are 24 rectrices, a number not exceeded in any of the Anseres, though found in certain Swans. All are peculiarly stiff and curved, with flat lamellar rhachises. The cæca are long, measuring 6·75 and 7·75 inches respectively in the two specimens. The ambiens muscle is large, and peculiar in that its tendon *perforates* the large-sized triangular patella, just as it does in *Phalacrocorax* and the extinct *Hesperornis*.

The carina sterni is shallow, as might have been expected in a bird with such weak powers of flight as *Biziura* has. There is a minor myological peculiarity in the hind limb of *Biziura*, such as I have not yet observed in other Anserine birds. In all these the *flexor longus hallucis* and *flexor profundus digitorum* blend together towards the lower part of the tarso-metatarse, a comparatively very insignificant tendinous slip being given off from the tendon of the first-named muscle to the hallux before it blends with the other[2]. In *Biziura* the two tendons completely blend, but the small tendinous slip, given off, as usual, before they unite, does not go to the *hallux* as it normally does, but continues down to the bottom of the bone, and is there lost on one of the annular masses of fibro-cartilage surrounding the other flexor tendons. The ***flexor brevis hallucis***, which is present, though small, is thus the only functional flexor of that digit.

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[1] Murie, P. Z. S. 1869, p. 140; and Garrod, Coll. Papers, p. 245.

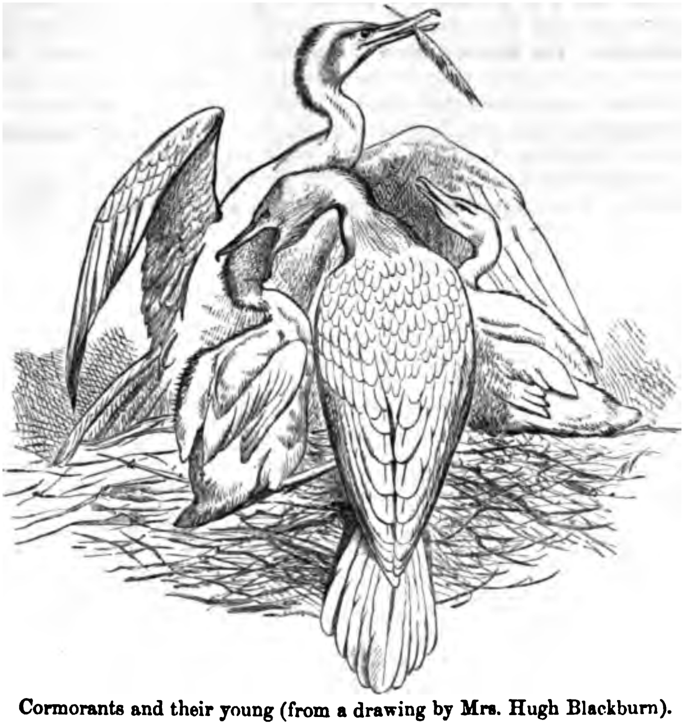
[2] Garrod, Coll. Papers, pp. 293 and 298.

June 6, 1882.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary called attention to the curious way in which the young Cormorants, lately hatched in the Gardens, were fed by the parent bird, and exhibited a drawing by Mrs. Hugh Blackburn, taken on the 9th ult., illustrating this subject.

Two Cormorants deposited by Capt. Salvin in the autumn of 1881 had paired in March last, and built a nest of sticks on a stump in the enclosure called the "Gull pond." Two young ones were hatched on the 22nd April last, after four weeks' incubation, both parents taking turns on the nest. The young birds were at first naked, but soon became covered with black down-plumage, whence they were now beginning to moult into their adult dress.



Cormorants and their young (from a drawing by Mrs. Hugh Blackburn).

As would be seen by the illustration, the parents fed the young ones by allowing them to poke their heads far down into the parents' throats and to extract the semidigested fish from the stomach.

In Capt. Salvin's letter to the 'Field' on this subject (vol. lix. p. 693, May 2, 1882) it was stated that the young were only fed in this manner by the male bird; but Mr. Bartlett had assured himself that both male and female parent had been seen to feed the young in the same way.

Mr. H. J. Elwes, F.Z.S., made some remarks on his recent expedition to the Aures Mountains of Algeria, and exhibited a specimen of a Stonechat (*Saxicola*) obtained there, which he believed to be new to science.

The Secretary placed upon the table a series of the Diurnal and Nocturnal Lepidoptera bred in the Insect-House during the past month, and called special attention to specimens of *Attacus roylei* and *Cricula trifenestrata*, both from India, as not having been reared in 1881.

The following papers were read:—

1. Notes on some Points in the Anatomy of the Æluroidea.

By ST.-GEORGE MIVART.

[Received May 9, 1882.]

In studying the Æluroidea for the purpose of trying to ascertain the number and nature of the groups into which that suborder might be best divided, I noted, as carefully as I could, such points in the anatomy of a number of species as I had an opportunity of examining. I now venture to lay before the Society some selections from these notes as a supplement to, and further justification of, the conclusions I lately had the honour of submitting to the judgment of the same Society[1].

It is only the osteology which I have had the opportunity of studying with any approach to completeness; but I have made such notes on the other systems of organs as I have been able to collect.

OSTEOLOGY.

THE AXIAL SKELETON.

The Vertebral Column.

The greatest number of vertebræ of which I have found the spinal column to be composed is 60 (*Arctictis*) and 59 (*Cryptoprocta* and *Paradoxurus*). The smallest number is 33 (in a Manx Cat).

The general range is from 50 (*Suricata*) and 51 (*Cynogale*) to 56 and 57.

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[1] P.Z.S. 1882, p. 135.

In absolute size the longest I have met with is that of a Lion, 174″·5. The smallest is that of *Helogale*, the skeleton of which I have not met with.

The Cervical Vertebræ.

The greatest absolute length of the cervical vertebræ which I met with was in the skeleton of a Tiger, where they measured 26″·0; but in *Crocuta* they attained 24·1.

The greatest proportion borne by the cervical region to the axial column from the atlas to the postaxial end of the sacrum—the latter being taken as 100—was 32·9 (*Proteles*). The next longest were 28·3 (*Hemigalea*), 27·9 (*Hyæna*), 27·4 (*Viverricula*), and 26·5 (*Genetta* and *Cynogale*). The smallest proportions were 19 (*Hemigalidia*) and 18·8 (*Arctictis*). In the *Felidæ* I found it to vary from 19·3 to 22·6.

The *atlas* in the *Felidæ* is provided with large transverse processes, each of which projects outwards almost, if not quite, as much towards its preaxial as towards its postaxial end; and the transverse processes project postaxiad but little beyond the postaxial margin of the central part of the atlas. In the *Hyænidæ*, on the other hand, the two transverse processes project considerably more backwards, while the postaxial end of each projects outwards equally beyond its preaxial end; so that the atlas has the appearance of being furnished with two obtusely pointed wings extending much outwards and considerably backwards.

In the *Viverridæ* various intermediate conditions occur, *Genetta* approaching the Cats most nearly, and *Suricata* having the transverse processes the most diverging, and *Viverra* the most postaxially projecting. Sometimes a small pointed spine projects postaxiad from the middle of the postaxial margin of the body, as in the *Galidictinæ* and *Herpestes*.

In a young *Hyæna*, in the Museum of the Royal College of Surgeons (no. 4474 c), the body of the atlas remains distinct.

The *axis* varies as to the shape of its spinous process, the degree of development of its ventral ridges, and the development of its hyperapophyses. The spinous process may have its dorsal margin nearly straight, as in the Cat, or strongly convex, as in *Viverra*. Its anterior margin may be strongly pointed, as in the Civets, or its hinder end, as in the Cat. The hinder part of the spinous process may be much produced upwards, as in *Suricata*, or may bifurcate, as in the *Hyænidæ*. The ventral, antero-posterior ridges of the axis are greatly developed in the *Galidictinæ*, *Herpestes*, and *Viverra*. They are but little marked in the *Hyænidæ* and *Suricata*, and still less in the Cat. The hyperapophyses[1] are very marked in *Suricata* and the *Hyænidæ*, where we have the pointed ends of the postaxial bifurcation of the spinous process, beneath these the hyperapophyses, and beneath these again the postzygapophyses.

The remaining cervical vertebræ attain an exceptional size and strength, as well as length, in the *Hyænidæ*, and are generally more developed in the *Viverridæ* than in the *Felidæ*. Comparing the cervical vertebræ of the Civet with that of *Felis catus*, it may be remarked that while the plate-like transverse processes of the third vertebra are no larger (if not somewhat smaller) relatively in the Civet, those of the 4th, 5th, and 6th vertebræ are relatively larger; the neural laminæ are more concave dorsally, and the hypapophyses are much stronger, and the hyperapophyses more marked. The Genet is more cat-like; but, in the specimens examined, the distal ends of the plate-like transverse processes of the 4th, 5th, and 6th vertebræ project more preaxiad than in the Cat or Civet. *Paradoxurus* presents characters intermediate between those of the Cat and the Civet.

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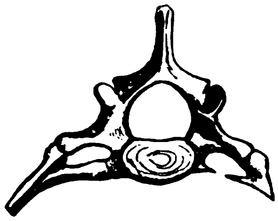
[1] For these processes see P. Z. S. 1865, p. 576.

Arctictis is very exceptional as to its cervical vertebræ, their transverse processes being so little extended antero-posteriorly, the plate-like parapophysial parts of each transverse process of even the 5th and 6th cervical vertebræ being very little broader than the diapophysial part. The distal ends of the transverse process of the vertebræ posterior to the third are not all produced preaxiad distally; nevertheless the hypapophyses are more marked than in *Felis catus*. There is a distinct rib, with both capitulum and tuberculum, on the left side, and a less perfect rib on the other side, of the 7th cervical vertebra of the specimen of *Arctictis*, No. 1200 B, in the collection of the British Museum.

Fig. 1.



Seventh cervical vertebra of an *Arctictis binturong*, showing the perfect rib on the one side.

Cryptoprocta differs remarkably from *Arctictis* in the greater antero-posterior extent of its plate-like transverse processes and in the preaxiad extension of the distal ends of those of the 3rd, 4th, 5th, and 6th vertebræ. There are marked hyperapophyses to the first two or three vertebræ. These processes, as also the cervical metapophyses, are very distinct on the 2nd, 3rd, 4th, 5th, and 6th vertebræ of some *Herpestes*[1]. In *Felis catus* hyperapophyses are not only developed above each postzygapophysis of the axis, but these become more marked on the 3rd cervical vertebra, less on the 4th, vanishing at the 5th. Metapophyses are also developed beneath the præzygapophyses of the 3rd, 4th and 5th vertebræ, and may be traced in some of the larger Cats on the hinder part of the neural arch of the last four cervical vertebræ. The transverse processes form large osseous plates in *Proteles*, much as in *Viverra*; nevertheless in *Hyæna* they are relatively very small, smaller and less plate-like than even in the Cats.

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[1] *E.g.* in no. 1178 A in the British Museum.

The Dorsal Vertebræ.

The greatest length of the dorsal region which I have met with is 39″·4 (*Crocuta*) and 38″·0 (*Felis tigris*).

Its greatest relative lengths (the spine, from the preaxial margin of the atlas to the postaxial margin of the sacrum, being taken as 100) are 45·6 (*Hyæna*) and 45·4 (*Suricata*); the smallest are 34·4 (*Genetta*) and 34·8 (*Cynictis*). The *Felidæ* I find to vary from 36·1 to 39·2, the *Viverridæ* from 34·4 to 45·4, and the *Hyænidæ* from 40·4 (*Proteles*) to 45·6, as above given.

Compared with the cervical region, its greatest lengths are in *Arctictis* and in *Suricata*, viz. as 238·2 and 231·6 to 100 respectively. It is often nearly twice as long as the cervical region. It exceeds the cervical region least in *Proteles*, where it is but 122·7 to 100.

The greatest number of dorsal vertebræ is found in all *Hyænidæ*, viz. 15. I have found 14 in *Paradoxurus*, *Arctictis*, *Cynogale*, some *Herpestes*, *Bdeogale*, *Crossarchus*, and *Galidictis*, 13 in the other genera.

The dorsal spinous processes are generally more relatively extended antero-posteriorly—more plate-like—in the *Viverridæ* than in the *Felidæ*, especially in at least some *Herpestes* and in *Eupleres* and *Suricata*. In *Arctictis* these spines are exceptionally low and inclined postaxiad; that of the first dorsal nearly equals in length that of the seventh cervical. On the other hand, in *Hyæna* the difference in length between these two spinous processes is at its maximum.

Generally, as in the Cat, the 11th dorsal vertebra is the first the spinous process of which begins to incline preaxiad.

In *Galidictis* the spine of the 12th dorsal is vertical, while those of the 11th and 13th incline towards it.

In *Hemigalea* the spine of the 11th dorsal inclines forwards, meeting that of the 10th.

In *Cynictis* it is the 13th vertebra which first inclines preaxiad.

In *Eupleres* and *Suricata* it is the 12th which so inclines, and this is the first to have the anapophyses and metapophyses distinctly differentiated.

In *Felis catus* these latter processes are quite distinct on the 11th dorsal vertebra.

In *Hyæna* the change which takes place in the direction of the dorsal spinous processes is a gradual one between the 12th and 14th vertebræ, the 13th being nearly upright.

Proteles exhibits a very exceptional character: the spinous pro-dorsal vertebra bifurcates more or less[1] laterally; f the next six show a tendency similarly to bifurcate; e 12th dorsal begins to curve over preaxially towards f the 13th does so more decidedly, or may quite incline the 14th always does.

The Lumbar Vertebræ.

reatest absolute lengths of the lumbar region which I have h are 40″·0 (Tiger) and 32″·5 (Lion). The longest in the *idæ* is 17″·1 (*Cryptoprocta*); in *Crocuta* it is 15″·2.

greatest relative length, measured as before, is 37·4 (Wild , 32·5 being the smallest I find amongst the *Felidæ*. In the *verridæ* 34·4 (*Nandinia*) is the highest, and 20·2 (*Proteles*) in e *Hyænidæ*. The smallest of the *Viverridæ* is 25·0 (*Cynogale*) and 25·8 (*Suricata*). The smallest of all the Æluroids is 17·6 (*Crocuta*).

Compared with the dorsal region it may be as 103·6 to 100 (Wild Cat) or 93·1 (*Nandinia*), or only 38·5 (*Crocuta*). It never equals the dorsal region in length in the *Viverridæ* or *Hyænidæ*.

The number of lumbar vertebræ is constantly 7 in the *Felidæ*; 6 or 7 in the *Viverridæ*, except in *Arctictis*, where it is only 5 as in the *Hyænidæ*.

The transverse processes are exceptionally short in *Arctictis*. In *Proteles* the neural spines are more quadrate and upright than in the *Felidæ* or *Viverridæ*; and they are still more vertical and quadrate in *Hyæna* and *Crocuta*.

The Sacrum.

The greatest absolute length of the sacrum I have met with is 9″·5 (Tiger). The longest in the *Viverridæ* is 5″·1 (*Viverra civetta*). In *Crocuta* it is 7″·6.

Its greatest relative length, estimated as before, is 10·9 (*Crossarchus obscurus*), while 7·8 is its greatest in the *Felidæ*. The smallest of all I have measured[2] is 5·5 (Manx Cat), 6·3 (*Proteles*), and 6·9 (*Hemigalea*).

The number of sacral vertebræ is almost always 3; but there may be 4 in *Hyæna* and *Crocuta*.

The neural spines are more developed in the *Viverridæ* than in the *Felidæ*, and notably so in *Arctictis*.

The Caudal Vertebræ.

The absolutely greatest lengths I find to be 88″·0 (Tiger) and 81″·7 (*Arctictis*).

The greatest relative lengths are 153·9 (*Nandinia*), 151·0 (*Genetta*), 146·4 (*Arctictis*), and 122.5 (*Paradoxurus*). Its least dimensions are 8·5 (Manx Cat) and 8·7 (*Suricata*).

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[1] It bifurcates very decidedly in the skeleton in the Museum of the Royal College of Surgeons. In that in the British Museum there is only a slight bifurcation towards its apex.

[2] *Cynogale*, according to De Blainville's figure, would give 5·1.

The number of caudal vertebræ varies from 29 (*Cryptoprocta* and *Paradoxurus*) to 3 (Manx Cat), 19 (*Crocuta*), and 20 (*Crossarchus* and *Suricata*). The neural arch ceases to be completely developed at from the 6th (*Hyæna*) to the 12th (*Arctictis*) vertebra.

The longest caudal vertebræ may be the 9th, 10th, and 11th (Cat), the 10th, 11th, and 12th (Civet), the 12th, 13th, and 14th (*Arctictis*), or the 13th, 14th, and 15th (*Proteles*).

Chevron bones may be developed beneath adjacent pairs of caudal vertebræ from the interval between the 1st and 2nd to between the 16th and 17th (*Arctictis*).

Transverse processes may cease to be distinct at the 6th caudal (sometimes in *Hyæna*), or may continue on to the 10th caudal (*Arctictis*).

The Sternum.

The sternum consists generally of seven sternebræ (including the manubrium) and a xiphoid cartilage. Sometimes in *Herpestes* and *Crossarchus* there are 8 sternebræ; and there are 8 in *Eupleres*. There may be but 6 sternebræ, as in *Proteles* and *Hemigalea*.

The manubrium is sometimes separate[1] from that sternebra which is placed between the attachments of the 1st and 2nd costal cartilages.

The manubrium is very pointed in *Hemigalea*. In *Arctictis* it is very exceptionally expanded transversely towards its middle, so that it has somewhat the appearance of the head of a lance. It has also a median ventral crest or keel—a condition I have found in no other Æluroid.

The last sternebra is broad and the xiphoid very broad in *Proteles*.

The Ribs.

The number of pairs of ribs has been already indicated in the notes given respecting the dorsal vertebræ. The number of true ribs may be 8, 9, or 10. 9 is the general number of true ribs, there being 5, 4, or 3 false ribs. In the *Hyænidæ*, however, there are 8 true ribs and 7 false ones.

The ribs are generally broader in proportion to their length in the *Viverridæ* than in the *Felidæ*. This is especially the case in *Eupleres* and the *Hyænidæ*.

The Skull.

The absolutely longest Æluroid skulls I have met with are 26″·8 and 26″·6 (Tiger and Lion). The longest non-feline skull (measured from the roots of the upper incisors in front to the "basion" or mid anterior margin of the foramen magnum) is 22″·5 (*Crocuta*); and the longest Viverrine skulls are 13″·9 (*Arctictis*) and 13″·4 (*Viverra civetta*).

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[1] Sometimes, as in *Arctictis*, and as in the Paradoxure No. 4285 A in the Museum of the Royal College of Surgeons, two minute rounded ossicles are placed between the manubrium and the first sternebra behind it. I have found an indication of such distinctness in an adult *Eupleres*.

The length from the atlas to the end of the sacrum being taken as 100, the relatively longest skulls thus measured have the proportions of 29·5 (*Cynogale*) and 28·9 (*Genetta*). The shortest has 19·8 (Leopard). The shortest Viverrine are 21·4 (*Viverra civetta*) and 21·9 (*Cryptoprocta*).

The greatest width between the outsides of the zygomata is 22″·0 (Tiger). The broadest non-feline skull at the zygomata is 18″·3 (*Crocuta*); and the broadest Viverrine skulls are 7″·3 (*Viverra civetta*) and 7″·0 (*Cryptoprocta*).

The greatest widths of the zygomata in proportion to the spine at 100 are 24·4 (*Suricata*), 21·5 (Lion), and 21·2 (*Crocuta*). The shortest is 10·5 (*Eupleres*).

The length of the skull from basion to præmaxilla being taken as 100, the (relatively) broadest zygomatic arches measured across are 89·4 (*Suricata*) and 89·3 (*Felis*), the *Hyæna brunnea* being 83·4. The narrowest *Felis* is 80·4, the narrowest Viverrine (*Herpestes*) 44·4.

I have much desired to find a line to be measured externally as a basicranial axis. The received basicranial axis can only be measured in a vertical longitudinal section, and so can rarely be got at. I should have been well satisfied with a line from the basion to the front end of the præsphenoid or of the basisphenoid, if either of these two latter points were generally determinable externally; but, unfortunately, such is not the case. I have therefore been compelled to take as *a base* a line drawn from the basion to a point which may, for convenience, be distinguished as the "*ovalion*," and which is the middle point of a transverse line joining the hindmost point on the margin of one foramen ovale with that of the other.

This base, compared with that of the spine (from the atlas to the end of the sacrum) taken as 100, I never find to be more than 9·0 (*Hemigalidia*) or less than 4·5 (*Felis*).

Its greatest proportion in *Felis* is 6·2, its least proportion in the *Viverridæ* is 5·1 (*Viverra civetta*). In *Crocuta* it is 6·0, in *Proteles* 7·3.

The base, compared with the total cranial length at 100, has for its highest proportions 31·1 (*Galidia*), 28·7 (*Hemigalidia*), and 28·2 (*Felis*). Its smallest proportion in *Felis* is 20·5; and the smallest of all are *Hyæna brunnea* (21·1) and *Suricata* (19·3).

If this base be taken as 100, then the greatest relative expansions of the zygomata are 463·6 (*Suricata*), 400·0 (*Felis*), and 395·6 (*Hyæna brunnea*). The smallest are 194·4 (*Eupleres*) and 195·2 (*Genetta*).

The greatest relative breadths of the brain-case, compared with the spine at 100, are 13·8 (*Suricata*) and 13·3 (*Felis*), its least breadth 5·9 (*Viverra civetta*). Its greatest breadths compared with the length of the skull at 100 are 54·5 (*Felis*) and 50·8 (*Suricata*); its least proportion is 27·0 (*Hyæna brunnea*). Its greatest breadths compared with the base taken as 100 are 211·7 (*Felis*), 263 (*Suricata*), and 180·0 (*Crossarchus*); its least proportions thus estimated are 102·7 (*Proteles*) and 115·6 (*Viverra civetta*); the smallest I have found in *Felis* is 145·4.

The greatest total lengths of the palate bear proportions to the spine (atlas to sacrum as 100) of 17·9 (*Herpestes*) and 17·5 (*Crossarchus*). Its least proportion is 9·6 (*Felis*), the largest proportion I have found in *Felis* being 14·7. The shortest Viverrine palates, thus estimated, are 10·9 (*Viverricula*) and 11·5 (*Viverra*, *Galidia*, and *Cryptoprocta*).

Compared with the cranial length at 100, the greatest proportions the palate attains are 62·8 (*Bdeogale*) and 61·6 (*Herpestes*); its least is 43·4 (*Felis*). Compared with the base at 100, its greatest relative lengths are 290·9 (*Suricata*), 272·7 (*Felis*), and 268·2 (*Arctogale*); its smallest proportions in length are 153·8 (*Felis*) and 150·0 (*Galidia*).

The greatest breadths of the palate, compared with the spine at 100, are 12·8 (*Crocuta*), 11·4 (*Felis*), and 10·0 (*Suricata*). Its least relative dimensions are 3·9 (*Eupleres*), 5·4 (*Cynogale*), and 5·9 (*Viverra civetta*). Its smallest proportion in *Felis* is 7·8.

The greatest proportional breadths of the palate, compared with the total cranial length at 100, are 49·3 (*Crocuta*), 46·9 (*Felis*), and 36·8 (*Suricata*); its least proportions are 22·7 (*Arctogale*) and 16·8 (*Eupleres*). The greatest proportions of its breadth compared with the base at 100 are 213·4 (*Crocuta*) and 200·0 (*Felis*); its smallest is 100·0 (*Hemigalidia*, *Arctictis*, and *Poiana*).

The projection of the palate backwards behind the upper molars compared with the total cranial length at 100 is greatest in *Proteles* (20·8), *Arctictis* (18·7), and *Suricata* (16·9). I have found its maximum in the Cats to be 11·9, and its minimum 4·6. In *Genetta* it is 5·0. It is least in *Hyæna brunnea* (4·5) and *Nandinia* (2·6).

The interorbital breadth may be in a proportion as large as 7·3 (*Hemigalidia*), and as small as 2·5 (*Genetta*), compared with the spine at 100. Compared with the total cranial length at 100, it ranges from 27·5 (*Galidia*) down to 8·7 (*Genetta*).

The postorbital breadth similarly ranges from 10·0 (*Felis*) to 3·0 (*Viverra*), and from 45·0 (*Felis*) to 12·2 (*Cynogale*) respectively.

The orbits are rarely enclosed by bone, as sometimes in *Felis*, *Herpestes*, *Cynictis*, *Suricata*, and almost in *Rhinogale*. The postorbital processes, on the other hand, may be almost or quite obsolete, as in *Cynogale* and *Arctictis*.

Except in *Proteles* and the above mentioned Viverrine genera, in which the orbits may be enclosed by bone, the postorbital processes of the frontal are never so long in the *Viverridæ* as they generally are in the *Felidæ*.

The face is generally shorter as compared with the cranium in the *Felidæ* than in the *Viverridæ*.

The *auditory bulla* is always an ossified convex prominence except in *Nandinia*, where it is cartilaginous. It may be quite smooth and unconstricted, showing no external sign of internal division, as in the *Felidæ*. There may be no internal septum, as in *Crocuta*. There may nevertheless be an almost complete internal septum dividing each bulla into two chambers, with only a minute opening on the septum, as also in the *Felidæ* and *Viverrinæ*. The septum may have a somewhat larger aperture, as in the *Herpestinæ* and *Proteles*; or the septum may be represented only by two osseous ridges tending to divide off a small anterior chamber in each bulla, as in *Hyæna*.

The two chambers of the bulla may be placed, one rather internally and the other externally, as in the *Felidæ* and *Herpestinæ*; or one behind the other, as in the *Viverrinæ*. If placed one internally and one externally, the more posterior (which does not contain the auditory ossicles) may be placed the more internally, as in the *Felidæ*, or the more externally, as in the *Herpestinæ*. The external chamber may be not merely placed the more externally, but may be posteriorly and strikingly everted outwards, as in the *Herpestinæ*.

The bulla may narrow much anteriorly, as in *Paradoxurus*. Its anterior chamber may be hardly bullate, as in *Cynogale*, or very decidedly so, as in *Genetta* and *Herpestes*.

The *external auditory meatus* is generally very short, but may be prolonged, as in *Suricata* and *Hyæna*. Its posterior margin may project the more, as in most *Viverrinæ*, or its anterior margin, as in most *Herpestinæ*, or its inferior part, as in *Hemigalea*.

The floor of the meatus may be imperfectly ossified, as in *Suricata* (where there is a longitudinal fissure) and in *Herpestes* (where there is a foramen). Instead of a fissure or foramen there may be a deep groove, as in the *Galidictinæ*.

The external aperture of the auditory meatus may be large and rounded, as in *Felis*; or oval, as in many *Viverrinæ*; or small and triangular, as in *Herpestes* and *Suricata*.

There may be a very deep pit (to receive the hyoidean cornu) on the outer side of the bulla, just below the external auditory opening, as in *Arctictis*.

The *mastoid* may be prominent, as in *Felis*, *Hyæna*, and *Suricata*; or not at all so, as in most *Viverrinæ*.

The *paroccipital process* may not depend below the bullæ or may be very slightly prominent, as in *Felis*. It may depend below the adjacent part of the bulla as a distinct process, as in *Viverra civetta* and most *Viverrinæ*; or it may not do so at all, as in the *Herpestinæ*.

Sagittal and *lambdoidal* ridges may be greatly developed, as in the large Cats, and especially in the Hyænas; or they may be almost evanescent, as in *Eupleres*, where also the zygomata are very slender. The occipital region may be very exceptionally prominent in the middle, as in *Eupleres*.

The *mesopterygoid fossa* may be to the cranial length at 100 as 23·9 (as sometimes in *Felis*), or only as 11·1 (as sometimes in *Herpestes*).

The average breadth of the palate compared with its length in the *Felidæ* is as 80·2 to 100. It may be only 32·5, as in *Eupleres*, or 33·8, as in *Cynogale*. It is 62·5 in *Genetta*, and 51·3 in *Viverra civetta*. It is 87·4 in *Crocuta*. In *Suricata* it is 65·6.

An *alisphenoid canal* may be present, as always in the *Viverrinæ* (except generally in *Viverricula*) and in the *Herpestinæ* (save in

Crossarchus, where it may be only imperfectly enclosed by bony processes). It may be entirely absent, as in the *Felidæ*, *Galidictinæ*, *Euplerinæ*, and *Hyænidæ*.

It may occasionally be present where it is normally absent, as in *Viverricula*.

There may be no *carotid canal* (for the internal carotid artery), as in the *Felidæ*; or there may be a distinct canal, as in all other Æluroids. The hinder aperture of this canal may be placed at about the middle of the internal margin of the auditory bulla, as in the *Viverrinæ*, or rather more forwards, as in the *Hyænidæ*. The artery may enter the cranial cavity through an aperture concealed, or almost concealed, beneath the anterior end of the auditory bulla, as generally in the *Viverrinæ*; or it may enter through a very conspicuous foramen anterior to and within the bulla, as in the *Herpestinæ* and *Galidictinæ*. This foramen notches the sphenoid very deeply, so much as to seem sometimes even to perforate it.

The *condyloid foramen* may be exposed or concealed; and there may be considerable variation in this respect in different individuals of the same species.

The *palatine foramina* may be in the posterior third, or well within the posterior half, of the palate, as always in the *Felidæ*; or they may be well within the anterior half of the palate, and often within its anterior third, as in all non-feline Æluroids. In *Cryptoprocta* they are very near the hinder end of the anterior half. In *Cynogale* they are very far forwards, only a little behind the incisive foramina.

The *upper alveolar border* may be notched to receive the apex of a lower premolar, as in *Hemigalea*.

The *mandible* may have its *angle* extending backwards almost or quite on a line with the inferior margin of the horizontal ramus, as in most *Felidæ*. It may, on the other hand, be very much bent up towards the condyle, as in *Hyæna*. It may be singularly flattened beneath, as in *Proteles*. It may be very small, as in *Arctictis*, or everted (or bent in the opposite way to that in which it is bent in Marsupials), as in *Suricata*.

The hinder portion of the inferior margin of the horizontal ramus may be very concave, as in many *Viverrinæ*.

The coronoid process may be greatly elevated, yet inclining backwards towards its apex, as in the *Felidæ*. It may be elevated vertically, and more or less truncated at its summit, as in *Prionodon*. It may be raised but little, relatively, above the condyle, as in many *Viverrinæ*.

The symphysis is generally moderate, but may be greatly prolonged, as in *Galidictis*, where its proportional length to that of the mandible, from the front of the canine to the hinder end of the last molar, is as 62·9 to 100.

The *alveolar border* may be singularly everted towards its hinder end, as in *Arctogale*.

THE APPENDICULAR SKELETON.

The Pectoral Limb.

The proportion borne by the entire pectoral limb (humerus, radius, and manus) to the spine—the length from the front of the atlas to the hinder end of the sacrum being taken as 100—is never more than 77·9 (as sometimes in *Felis*), or less than 42·3 (*Viverricula*).

The greatest proportion amongst the *Viverridæ* is 66·4 (*Suricata*); the shortest found by me in the *Felidæ* was 52·9 (*F. eyra*).

The Scapula.

The extreme length of the scapula compared with of the spine (estimated as before) is as 21·0 to 100, as sometimes in *Felis*. In that genus I have found 18·6 to be the minimum proportion. In the *Viverridæ* it varies from 11·9 (*Nandinia*) to 18·9 (*Cynictis*). In *Proteles* it is 19·7, and in *Crocuta* 20·6.

The Civets have the scapula much more in the shape of a parallelogram than have the Cats, the preaxial border not being so convex. The metacromion is not so much developed; and the proportion borne by the infraspinatus fossa to the supraspinatus fossa is greater, as also in the Genets, in which the scapula is otherwise more feline. *Fossa* and *Paradoxurus* are intermediate between *Genetta* and *Viverra* in the form of the scapula; but the convexity of the preaxial border is generally situate nearer to the glenoid surface than it is in the Genet.

In *Cynogale* the scapula is much like that of the Civet, but the prominence of its preaxial margin is more rectangular in outline and less rounded.

Arctictis resembles *Paradoxurus*; but its infraspinatus fossa is still larger relatively; the spine is but little prominent, and the metacromion quite rudimentary. In *Herpestes* the metacromion is well developed. There is sometimes a prominence for the teres major; and the proportional size of the infraspinatus fossa may not be greater than in the Cat. In *Crossarchus* there is sometimes so sharp a prominence from the glenoid end of the convexity of the preaxial border as to form a deep suprascapular notch. The metacromion is well developed, as also in *Suricata* (where its apex is sharply bent backwards); the outer surface of the scapula is in this genus singularly concave. In *Galidia*, the convexity of part of the preaxial margin may be very great; but here, as seems to be generally the case, there is much individual variation in the form of the scapula. In *Eupleres* the metacromion is well developed, but the acromion may be very short. In *Cryptoprocta* the scapula is very like that of some Cats; the infraspinatus fossa is not so large relatively as in *Genetta*; the metacromion is well developed. In *Hyæna* the preaxial margin is rounded; the metacromion is *very* minute and placed quite at the end of the spine; the supraspinatus fossa is smaller relatively than in the Cats, or than in the *Viverridæ* generally; both it and the infraspinatus fossa are very concave. In

Proteles the scapula is not unlike that of ***Viverra***; the metacromion is rather larger and more pointed than in ***Hyæna***. In ***Proteles***, ***Hyæna***, and *Crocuta* the acromion is shorter than in the ***Felidæ*** or ***Viverridæ***, except sometimes in ***Eupleres***.

The angle formed by the axillary margin with the spine of the scapula varies from about 20° (*Suricata, Galidictis, Proteles*) to 35° (Lion and Tiger). The average angle is a little above 25°.

The Clavicle.

The clavicle is always very rudimentary or absent; nevertheless in *Genetta* I found to be about 1″·6.

The Humerus.

The absolutely longest humerus is 31″·5 (Tiger), the largest Viverrine humerus is 14″·0 (*Arctictis*). The greatest proportion of the humerus to the spine at 100 is 28·5 (sometimes in *Felis*), the shortest is 18·1 (*Eupleres*). The shortest feline proportion is 23·4; the greatest Viverrine proportion is 25·0 (*Arctictis*). *Crocuta* is 22·0, and *Proteles* 24·8. The Civet's humerus, compared with that of the Cat, is stouter, with the great tuberosity relatively more prominent, and the fossa outside it much deeper and larger. The supinator ridge is also stronger, while the bony bridge enclosing the foramen for the median nerve is more slender. There is sometimes an olecranal foramen. The humerus of the Genet is more like that of the Cat. There is always a condyloid foramen, except in *Cynogale*, the *Galidictinæ*, and the *Hyænidæ*. In *Paradoxurus* the internal condyle may be much prolonged. In *Arctictis* the humerus is much broadened out distally, with a rather small condyloid canal and a strong supinator prominence; there is no marked pit outside the great tuberosity. In *Cryptoprocta* exactly reversed conditions obtain, as the condyloid canal is very large in that genus (at its maximum), and there is a very marked pit outside the great tuberosity, as also in *Herpestes*, *Crossarchus*, and *Hyæna*. In *Herpestes* the humerus is much curved. In *Crossarchus* the deltoid surface is very prominent, and the development of the supinator ridge and the projection of the internal condyle are at their maximum. The deltoid surface is even more prominent in *Suricata*. In *Hemigalea* the humerus is a good deal bowed, the great tuberosity and the supinator ridge are little developed, but the internal condyle is very prominent. In *Viverricula*, on the contrary, the internal condyle projects so slightly that it is almost effaced. In the *Hyænidæ* the internal condyle is also relatively little developed, the deltoid surface is prominent, there is an olecranal perforation, and the pit outside the great trochanter may be wide and shallow as in *Hyæna*, or wide and deep as in *Proteles*.

The Radius and Ulna.

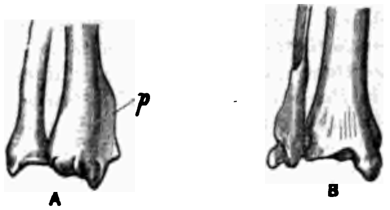
The absolutely longest radius is 26″·0 (Tiger); its greatest proportional lengths to the spine at 100 are 27·4 (sometimes in *Felis*) and

25·3 (*Proteles*). Its least proportion in *Felis* is 20·8. Its least proportion in the *Viverridæ* is 13·8 (*Viverricula*), and its greatest is 22·0 (*Suricata* and *Galidictis*). I have found it equal to the humerus in length in the Wild Cat and *Fossa*, and almost equal in *Hemigalidia*. I have only found it absolutely longer than the humerus in *Eupleres* and *Crocuta*.

The radius and ulna are long and slender in *Fossa*, *Galidictis*, and *Eupleres*. In *Hemigalea* the radius (which is a good deal bowed) is furnished with a singular plate-like expansion towards and at the ventral end of its outer or radial border. A more or less rudimentary development of the process may occur also in *Paradoxurus*, and a trace of it in *Cryptoprocta*.

The olecranon may, as in *Viverra civetta*, be more bent postaxiad than in most forms, and than even, relatively, in the Great Cats. A remarkable process may be also developed from the olecranon, extending mesiad. This is seen in *Civetta*, but attains its maximum in *Cryptoprocta*, where it reminds one of the inflected mandibular angle of a marsupial. This is little developed in *Hemigalea*, which, however, has a plate-like process, or ridge, developed from the middle of the distal fourth of the ventral surface of the ulna, extending down to the root of the styloid process; into this plate-like ridge the supinator longus, pronator teres, and the (large) pronator quadratus muscles are inserted. This ridge also exists in *Viverricula*.

Fig. 2.



A. Distal end of dorsal surface of right radius and ulna of *Hemigalea*: *p*, plate-like process. B. Distal end of tibia and fibula.

The Manus.

The greatest length of the manus (measured from the junction of the radius and carpus to the end of the third digit), compared with that of the spine, is 23·9 (*Proteles*), the least is 11·5 (*Viverricula*). In *Felis* I have found it range from 17·0 to 22·0. The greatest relative length of the third metacarpal is 12·5 (*Proteles*), and the shortest is 4·2 (*Cynogale*). The greatest relative length of the third digit is 10·0 (*Felis*), and 9·5 (*Suricata*); the shortest is 5·2 (*Viverra*). The relatively longest third ungual phalanx is 4·5 (*Suricata*); the shortest is 1·3 (*Viverra*).

The metacarpus is thus proportionally most elongated in and *Felis*. It is shorter and stouter in the *Viverridæ*, especially in *Hemigalea* and *Cynogale*; and the length of M^3 and M^4 is less in excess of that of M^2 and M^5 than in the Cats.

There is no pollex, save a rudimentary metacarpal, in *Hyæna*, *Crocuta*, *Suricata*, and *Bdeogale*. Though present in all the other genera, its length, compared with that of the index, may vary considerably. Thus the whole pollex may not extend down the metacarpal of the index so far as one quarter of the length of the latter, as in *Felis*.

It may extend half down the metacarpal of the index or more, as in *Proteles*, *Cynictis*, *Viverricula*.

It may extend down to the distal end of the metacarpal of the index, as in *Viverra civetta*, *Genetta*, *Fossa*, *Galidictis*, *Galidia*, *Herpestes* (often), *Crossarchus*.

It may reach to the middle of the proximal phalanx of the index, or sometimes even to its distal end, as in *Paradoxurus*, *Arctictis*, *Eupleres*, *Hemigalea*.

The metacarpal of the pollex may not extend even one quarter down that of the index, as in *Felis*.

It may reach nearly half down, as in *Viverricula*, *Herpestes*, and *Proteles*.

It may extend half down it, or a little more, as in *Viverra*, *Genetta*, *Fossa*, *Galidictis*, *Galidia*, and *Arctictis*.

It may nearly extend downwards as far as does the metacarpal of the index, as in *Paradoxurus*, *Cynogale*, *Hemigalea*, *Eupleres*.

The middle phalanges of the digits may be greatly excavated on one side to give place to the ultimate phalanges in their rolled-back or contracted position. This is the case in the Cats; they are almost as much so in *Hemigalea*, much less so in the *Viverrinæ*, and not at all in the *Galidictinæ*, *Herpestinæ*, and *Hyænidæ*.

The ultimate phalanges may be very greatly arched and pointed, and with a deep lamina of bone round the proximal part, to shelter the root of the claw externally, as in the Cats generally; sometimes less so, as in *Cynælurus*; still less so, as in the *Viverrinæ*; or long, hardly arched, and with but a very small external lamina, as in the *Hyænidæ* and *Herpestinæ*, especially in *Suricata*.

The Pelvic Limb.

The proportion borne by the entire pelvic limb (femur, tibia, and pes) to the spine is never more than 93·8 (some *Felis*), or less than 55·6 (*Viverra*). The longest proportion amongst the *Viverridæ* is 79·9 (*Suricata*); the shortest found by me in the *Felidæ* was 75·6.

The greatest proportion borne by the entire pelvic limb to the entire pectoral limb at 100 is 139·8 (*Felis eyra*), the smallest is 94·4 (*Crocuta*). In none but *Crocuta* is the pelvic limb shorter than the pectoral one. The shortest proportion in the Cats is 113·1 (*Felis tigris*). In the *Viverridæ* the longest is 136·6 (*Nandinia*), and the shortest is 112·0 (*Arctictis*). In *Proteles* it is 104·8.

The Pelvis.

The absolutely longest pelvis (measured from the most preaxial part of the ilium to the tuberosity of the ischium) I found was 30″·4 (Lion). In *Crocuta* it was 12″·45. The greatest lengths I found in the *Viverridæ* were 12″·7 (*Arctictis*) and 11″·7 (*Viverra civetta*).

Compared with the length of the spinal column (atlas to sacrum), taken at 100, the greatest proportional length of the pelvis was 27·1 (*Hemigalidia*), and the smallest 14·4 (*Crocuta*). The smallest in the *Felidæ* was 20·9, and the smallest in the *Viverridæ* 17·4 (*Genetta*).

The greatest breadth of the ilium I found to be in *Viverra civetta* 3″·0, in *Genetta* 1″·3, *Paradoxurus* 1″·0, in *Galidictis* 0″·9, in *Galidia* 0″·9, in *Arctictis* 2·″4, in *Cryptoprocta* 2″·0, in *Herpestes* 0″·8, in *Eupleres* 1″·7, in *Crossarchus* 1″·3, in *Suricata* 1″·3, in *Proteles* 4″·2, in *Hyæna striata* 7″·9, in *Crocuta* 10″·4, and in *Felis catus* 1″·8.

The ilium has its ventral preaxial angle enormously produced in the *Hyæninæ*, its preaxial margin nearly straight, and its tuberosities greatly everted. In *Crocuta* these conditions especially obtain: the ilium is more concave externally; and the process for the rectus (preaxial to the acetabulum) is very strongly developed. In *Proteles* these characters exist in a less pronounced degree.

There may be two prominences (each like an ilio-pectineal prominence)—one just preaxiad to the acetabulum, and the other placed a little more ventrally on the pelvic brim. These may both be found (at least sometimes) in *Cryptoprocta*, *Viverra*, *Crossarchus*, and especially in *Suricata*.

The Femur.

The absolutely longest femora I found were 35″·5 (Tiger) and 31″·3 (Lion). The largest Viverrine femur was 14″·7 (*Arctictis*). It is 22″·8 in *Crocuta*.

Compared with the spine at 100, the longest femur is 31·3 (*Felis*), 27·9 being the minimum feline proportion. The longest Viverrine proportions are 28·2 (*Cryptoprocta*), 27·5 (*Genetta*), and 26·7 (*Suricata*). The shortest are 19·3 (*Viverra civetta*) and 20·1 (*Viverricula*). In *Proteles* and *Crocuta* it is 26·5 and 26·4.

The femur is always a little longer than the humerus.

In the Civet and Genet the bone is relatively shorter than in the Cat, and the lesser trochanter is relatively somewhat smaller.

In *Paradoxurus*, *Nandinia*, *Cynogale*, and *Hemigalea* it is much flattened behind between the trochanters; and thus the lesser trochanter is thrown almost under the head of the femur instead of being behind (postaxial to) it. In *Arctictis* this flattening is at its maximum, the lesser trochanter is very small, the trochanteric fossa is shallow, and the great trochanter is relatively smaller than in other species. In *Crossarchus* and *Suricata* the femur becomes thicker in proportion to its length than in most species. In *Hyæna* the small trochanter is largely developed, and there is a large process above the outer condyle. In *Crocuta* there is no marked process of the kind, and the lesser trochanter is but of moderate size. In *Proteles*, which has a long and slender femur, the small trochanter is little developed, but there is a process above the outer condyle.

The Tibia and Fibula.

The absolutely longest tibia is 30″·2 (Tiger). The greatest proportional lengths to the spine at 100 are 31·8 (*Felis*) and 29·1 (*Galidictis*). The least proportion in *Felis* is 24·7. Its least proportion in the *Viverridæ* is 19·3 (*Viverricula*); and its greatest after *Galidictis* is 28·6 and 28·4 (*Genetta* and *Hemigalidia*). I have found it equal to the femur in length in *Nandinia*, *Herpestes*, *Crossarchus*, and almost so in *Proteles*. I have found it longer than the femur in the Wild Cat and Domestic Cats (but not the large Cats), the Civet, Genet, *Bdeogale*, *Cynictis*, *Suricata*, *Galidictis*, *Galidia*, and *Eupleres*. I have found it shorter than the femur in the larger Cats and in *Viverricula*, *Paradoxurus*, *Hemigalea*, *Arctictis* *Cynogale*, *Cryptopacta*, and the *Hyæninæ*. The tibia is always longer than the radius, except in the *Hyæninæ*, where it is shorter.

The tibia of *Hemigalea* is remarkable for the very great projection mesiad of the internal malleolus, which allows the pes to be more obliquely articulated, so that the plantar surface may be directed more inwards than in most Æluroids. In *Paradoxurus* the same condition exists, though in a less marked degree.

In *Eupleres* the fibula is exceptionally strong amongst the *Viverridæ*, and the process at its distal end is very strongly developed outwards and postaxially.

The Pes.

The greatest length of the pes (measured from the front of the distal end of the tibia to the end of the fourth digit) is 30″·7 (*Felis*); the least is 16″·2 (*Crocuta*), In the *Viverridæ* I have found it range from 25″·3 (*Galidictis* and *Suricata*) to 16″·3 (*Viverra civetta*). The length of the pes is always greater than that of the manus, except in *Crocuta*. They are exceptionally equal in *Arctictis*, where, the manus being as 100, the pes is 119·7.

The greatest relative length of the fourth metatarsal is 15·1 (*Felis*), and the least is 8·0 (*Cynogale*). The length of the fourth metatarsal corresponds with the third metacarpal.

The metatarsus is proportionally most elongate in the *Felidæ*. It is shortest and stoutest in the *Viverridæ*, especially in such forms as *Arctictis*, *Cynogale*, and *Hemigalea*.

There is no hallux, save a rudimentary metatarsal, in the *Felidæ*, *Hyæninæ*, *Cynictis*, *Bdeogale*, and *Suricata*. Though present in all the other genera, its length, compared with that of the index of the pes, may vary considerably.

The hallux (when developed) always extends half down the metatarsal of the index. It may only extend about half down the metatarsal, as in *Viverricula* and sometimes in *Herpestes*, or two thirds down, as in *Fossa*. It may extend down to the distal end of the metatarsal of the pedal index, as in the Civet and Genet. It may reach further than to the middle of the proximal phalanx of the index (as in *Paradoxurus*, *Nandinia*, *Galidictis*, and *Galidia*), or to its distal end, as in *Arctictis*, *Cryptoprocta*, *Eupleres*, *Crossarchus*, and *Hemigalea*.

The metatarsal of the hallux (when not rudimentary) always extends more than half way down that of the index, but may hardly reach further, as sometimes in *Herpestes* and *Viverricula*. It may extend much more than half way down it, as in *Fossa* and *Viverra civetta*. It may extend two thirds down, as in *Crossarchus*. It may extend four fifths down it, as in *Galidia*, *Galidictis*, *Cryptoprocta*, *Hemigalea*, and *Eupleres*. It may extend downwards nearly to the end of the metatarsal of the index, as in *Arctictis* and *Paradoxurus*.

The middle phalanges of the digits of the pes vary in form harmoniously with those of the digits of the manus; and similarly the form of the ultimate phalanges of both limbs vary similarly in the various different groups of species.

DIMENSIONS OF THE SKELETON IN SIX SPECIMENS OF THE GENUS *Felis*. (In each there are 13 dorsal, 7 lumbar, and 3 sacral vertebræ.)

	Length of cervical vertebræ.	Length of dorsal vertebræ.	Length of lumbar vertebræ.	Length of sacrum.	Length from atlas to end of sacrum.	Length of tail.	Number of caudal vertebræ.
	″	″	″	″	″	″	
Wild Cat	8·9	16·5	17·1	3·2	45·7	32·4	20
Common Domestic Cat .	8·0	12·0	13·0	2·4	35·4	26·1	20
Manx Cat	5·4	10·6	9·5	1·5	27·0	2·3	3
Leopard......................	16·0	31·0	29·0	6·5	82·5	78·0	23
Tiger	26·0	46·0	40·0	9·5	121·5	88·0	22
Lion	22·0	38·0	32·5	7·5	100·0	74·5	21
Average, excluding the caudal vertebræ of the Manx Cat	14·4	25·7	23·5	5·1	68·7	59·8	
Chetah	18·0	31·5	29·5	6·5	85·5		
Eyra	10·8	20·3	20·3	4·4	55·8		

	Wild Cat	Common Domestic Cat	Manx Cat	Leopard	Tiger	Lion	Average	Chetah	Eyra
Length of pelvic limb (femur, tibia, and pes).	39·0″	29·4	25·3	63·8	93·7	83·8	57·0	67·0	40·4
Length of 4th digit.	4·13″	2·9	2·7	8·0	10·5	9·5	6·29	7·0	...
Length of 4th metatarsal.	5·6″	4·5	4·1	8·0	12·0	11·0	7·5	9·75	5·7
Length of pes in front of tibia and fibula.	11·8″	9·4	8·3	20·0	28·0	25·5	17·3	20·0	12·6?
Length of os calcis.	3·2″	2·7	2·2	5·8	10·0	9·0	5·5	...	3·5
Tibia to root of malleolus.	13·8″	10·1	8·6	20·4	30·2	27·0	18·3	23·5	13·4
Femur from summit of head to condyloid surface.	13·4″	9·9	8·4	23·4	35·5	31·3	20·3	23·5	14·4
Length from summit of ilium to tuberosity of ischium.	9·6″	7·4	6·1	18·8	30·4	26·8	16·5	...	11·7
Length of pectoral limb (humerus, radius, and manus).	30·6″	24·0	20·8	53·9	82·8	73·8	47·3	58·5	29·6
Length of ungual phalanx.	0·9″	0·8	0·8	2·3	3·5	3·3	1·9	2·0	...
Length of 3rd digit.	3·5″	2·8	2·7	8·3	11·5	9·8	6·4	6·75	...
Length of 3rd metacarpal.	5·0″	2·7	2·6	6·6	10·8	9·0	6·1	7·75	...
Length of manus.	7·8″	6·2	5·7	16·7	25·3	22·0	13·9	15·5	8·5?
Radius from margin of its head to root of styloid process.	11·4″	8·8	7·4	17·2	26·0	25·0	15·7	22·0	9·7
Length from summit of head of humerus to surface of capitellum.	11·4″	9·0	7·7	20·0	31·5	26·8	17·7	21·0	11·4
Angle formed by scapular spine with axillary margin.	25°	27	30	27	35	35	28½	...	20
Greatest breadth of scapula.	4·55″	3·9	3·0	8·7	15·0	13·3	8·07	...	4·8
Length of scapula from margin of glenoid surface to vertebral end of scapular spine.	8·4″	6·2	4·9	14·5	23·0	21·0	13·0	...	7·8

	Basion to front of præmaxillæ.	Greatest width of zygomata.	Greatest breadth of palate.	Length of palate behind last molars.	Greatest length of palate[1].	From front of præmaxilla to between palatine foramina.	Basion to ovalion.	Length of mesopterygoid fossa to end of hamular processes.	Breadth of mesopterygoid fossa.	Length between roots of zygomatic arch inside the arch.	Greatest breadth of brain-case.	Interorbital breadth of skull-roof.	Breadth of narrowest part of skull behind postorbital processes.
Wild Cat	9″·2	7″·4	3″·6	0″·5	4″·0	2″·9	2″·6	2″·2	1″·3	2″·6	4″·5	1″·9	3″·4
Common Domestic Cat	7·5	6·7	3·5	3·5	3·5	2·4	2·1	1·6	1·2	2·9	4·1	1·8	3·4
Manx Cat	6·6	5·4	3·1	0·3	3·1	2·3	1·7	1·5	1·0	1·7	3·6	1·3	2·7
Leopard	16·4	13·2	7·4	1·4	8·6	5·7	4·0	3·1	2·4	4·6	7·0	3·4	4·5
Tiger	26·8	22·0	10·6	3·2	15·0	10·8	5·5	5·6	3·8	8·4	8·0	5·5	4·7
Lion	26·6	21·5	11·0	3·0	14·7	10·8	5·5	4·5	4·4	7·5	8·7	5·9	5·8
Average	15·5	12·7	6·5	1·46	8·1	5·8	3·6	3·1	2·3	4·6	5·9	3·3	4·1
Felis macroscelis	15·5	......	......	......	......	......	3·6	......	......	......	......	......	......
Felis planiceps	8·6	......	......	......	......	......	2·2	......	......	......	......	......	......

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[1] Measured from front of præmaxilla to hinder border of palate, neglecting processes and notches there.

	Length of median upper incisor I^1.	Length of outermost upper incisor I^3.	Vertical extent of P. 2.	Transverse extent of P. 2.	Antero-posterior extent of P. 2.	Vertical extent of P. 3.	Transverse extent of P. 3.	Antero posterior extent of P. 3.	Vertical extent of crown of P. 4.	Transverse extent of P. 4.	Antero-posterior extent of P. 4.	Transverse diameter of M. 1.	Antero-posterior dimension of M. 2.	Length of upper canine.
Wild Cat	″0·35	″0·4	″0·3	″0·2	″0·2	″0·5	″0·3	″0·7	″0·6	″0·5	″1·0	″0·4	″0·3	″1·2
Common Domestic Cat	?	?	0·2	0·15	0·15	0·55	0·3	0·55	0·5	0·4	1·0	0·2	0·15	1·4
Manx Cat	0·3	0·35	0·25	0·15	0·2	0·55	0·26	0·5	0·6	0·5	1·0	0·35	0·2	1·0
Leopard	0·6	1·6	0·7	0·3	0·4	0·9	0·6	1·4	1·3	1·1	2·2	0·5	0·35	3·0
Tiger	0·9	1·8	0·8	0·5	0·7	1·8	1·1	2·1	2·0	1·6	3·3	0·9	0·5	5·2
Lion	1·2	2·0	0·8	0·5	0·7	1·8	0·9	2·2	2·0	1·5	3·3	1·5	0·8	4·7
Average	0·66	1·23	0·51	0·3	0·39	1·1	0·58	1·24	1·2	0·9	1·9	0·64	0·35	2·7
Felis macroscelis											2·0	......	......	4·0
Felis planiceps			0·5	0·2	0·4	......	......	......	......	......	1·1	......	......	1·3
Tiger	1·0	2·1	......	......	......	......	......	......	......	......	......	......	......	3·2

	Length of lower molar series.	Length from front of first lower molar to end of condyle.	Length from front of upper canine to back of last upper molar.	Length from the same point to hinder side of mandibular condyle.	Length from front of lower canine to back of last lower molar.	Length of upper molar series.
Wild Cat	″	″	″	″6·7	″3·4	″2·3
Tiger	6·7	16·0	12·4	21·5	12·4	......
Felis macroscelis				12·5	7·0	3·5
Felis planiceps				6·3	3·5	2·5

Proportions of Parts of Skeleton of Felidæ.

The spinal column from front of atlas to end of sacrum being taken as 100, length of :—

	Cervical region.	Dorsal region.	Lumbar region.	Sacrum.	Tail.	Scapula.	Humerus.	Radius.	Manus.	Third metacarpal.	Third digit.	Ungual phalanx.	Pelvis.	Femur.	Tibia.
Average	20·9	37·4	34·2	7·5	87·0	18·6	25·7	22·8	20·0	8·8	9·3	2·7	24·0	29·5	26·6
Maxima	22·6	39·2	37·4	7·8	94·5	21·0	28·5	27·4	22·0	10·9	10·0	3·3	26·8	31·3	31·8
Minima	19·3	36·1	32·5	5·5	8·5	17·5	23·4	20·8	17·0	7·6	7·6	1·9	20·9	27·9	24·7

	Pes.	Os calcis.	Fourth metatarsal.	Cranial length.	Length of palate.	Breadth of palate.	Basion to ovalion.	Breadth of zygomata.	Breadth of brain-case.	Interorbital breadth.	Postorbital breadth at the narrowest.	Length of upper canine.	Antero-posterior extent of P. 4.	Humerus + radius + manus.	Femur + tibia + pes.
Average	25·1	8·0	10·9	22·5	11·7	9·4	5·2	18·4	8·5	4·8	5·9	4·0	2·7	68·7	81·2
Maxima	30·7	9·0	15·1	26·6	14·7	11·4	6·2	21·5	13·3	5·9	10·0	4·7	3·7	77·9	93·8
Minima	23·0	7·0	9·6	19·8	9·6	7·8	4·5	16·0	6·5	4·1	3·8	2·6	2·1	61·2	75·6

PROPORTIONS OF PARTS OF SKELETON OF FELIDÆ (*continued*).

The length of the skull from the basion to front of præmaxillæ being taken as 100, extent of:—

	Breadth of zygomata.	Breadth of palate.	Length of palate behind last molars.	Length of palate.	Length of mesopterygoid fossa.	Breadth of mesopterygoid fossa.	Breadth of brain-case.	Interorbital breadth.	Narrowest postorbital breadth.	Length of upper canine.
Average	82·0	42·0	9·4	52·2	20·0	14·8	38·0	21·2	28·6	17·4
Maxima	89·3	46·9	11·9	55·9	23·9	16·5	54·5	25·2	45·3	19·4
Minima	80·4	39·1	4·6	43·4	16·9	14·1	29·8	19·6	17·5	13·0
Felis macroscelis	......	......	......	......	......	......	......	......	......	25·8

	Length of outermost inisor.	Length of innermost incisor.	Antero-posterior extent of $\underline{\text{M. 1.}}$	Transverse extent of $\underline{\text{M. 1.}}$	Antero-posterior extent of $\underline{\text{P. 4.}}$	Transverse extent of $\underline{\text{P. 4.}}$	Antero-posterior extent of $\underline{\text{P. 3.}}$	Transverse extent of $\underline{\text{P. 3.}}$	Basion to ovalion.
Average	7·9	4·2	2·2	4·1	12·2	5·8	8·0	3·7	23·2
Maxima	9·7	4·5	3·2	5·6	19·4	7·5	8·5	4·0	28·2
Minima	4·3	3·3	1·8	2·6	10·8	5·3	7·3	3·2	20·5

	Basion to ovalion being taken as 100, extent of:—										
	Length of palate.	Breadth of palate.	From front of præmaxillæ to palatine foramina.	Breath of zygomata.	Breadth of brain-case.	Antero-posterior extent of $\underline{\text{M. 1.}}$	Transverse extent of $\underline{\text{M. 1.}}$	Antero-posterior extent of $\underline{\text{P. 4.}}$	Transverse extent of $\underline{\text{P. 4.}}$	Antero-posterior extent of $\underline{\text{P. 3.}}$	Transverse extent of $\underline{\text{P. 3.}}$
Average	225·0	180·5	161·1	352·7	163·8	9·7	17·7	52·7	25·0	34·4	16·1
Maxima	272·7	200·0	196·3	400·0	211·7	14·5	27·1	60·0	29·4	36·2	20·0
Minima	153·8	138·4	111·5	284·6	145·4	7·1	9·5	38·4	15·3	26·2	11·5

Proportion borne by the pelvic limb (femur, tibia, and pes) to pectoral limb taken as 100.	
Average	119·4
Maxima	127·4
Minima	113·1
Felis eyra	139·8
Felis cynælurus	114·5

PROPORTIONS OF PARTS OF SKELETON OF FELIDÆ (*continued*).

Atlas to end of sacrum being taken as 100, length of:—									
	Humerus.	Radius.	Femur.	Tibia.	Fourth metatarsal.	Manus.	Pes.	Humerus + radius + manus.	Femur + tibia + pes.
Felis eyra	20·4	17·3	25·8	24·0	10·2	15·2?	22·5?	52·9	72·3
Felis cynælurus	24·5	25·7	26·9	26·9	11·4	18·1	23·2	68·3	77·0

Length of palate being taken as 100, length from front of præmaxillæ to palatine foramina.	
Average..................	71·5
Maximum	74·2
Minimum	66·2

Extreme length of skull (basion to præmaxillæ) being taken as 100, length of:—									
	Basion to ovalion.	Upper canine.	Upper molar series.	From lower canine to last molar.	From lower canine to condyle.	Antero-posterior extent of P. 2.	Transverse extent of P. 2.	Vertical extent of P. 2.	Antero-posterior extent of P. 4.
Felis macroscelis	23·2	25·8	22·5	45·1	80·6	......	......	......	12·2
Felis planiceps..................	25·5	15·1	29·0	40·6	73·2	4·6	2·3	5·8	12·7
Average, as before	23·2	17·4	......	42·5	75·4	2·5	1·2	3·2	12·2

	Number of dorsal vertebræ.	Number of lumbar vertebræ.	Number of sacral vertebræ.	Number of caudal vertebræ.	Number of sternebræ.	Number of pairs of true ribs.	Length of cervical vertebræ.	Length of dorsal vertebræ.	Length of lumbar vertebræ.	Length of sacrum.	Length from front of atlas to hinder end of sacrum.	Length of tail.
Viverra civetta	13	7	3	23	7	9	16·1″	22·8″	18·4″	5·1″	62·4″	51·7″
Viverricula	13	7	3	25	7	10	10·5	14·0	10·8	2·9	38·2	33·3
Genetta	13	7	3	27–29	7	10	7·0	9·8	8·5	2·3	27·6	41·7
Genetta felina	13	7	3	25	7	10	10·8	14·0	12·7	3·2	40·7	43·2
Paradoxurus	14	6	3	29	7	8 or 9	8·4	14·6	9·7	2·6	33·3	40·8
Hemigalea	13	7	3	24	7	9	10 15	12·7	10·5	2·5	35·8	33·0
Nandinia	13	7	3	26	7	9	5·4	10·2	9·5	2·5	27·6	42·5
Arctictis	14	5	3	31	7	9	10·5	25·0	15·2	5·1	55·8	81·7
Cynogale	14	6	3	21	......	......	10·3	16·65	9·65	2·0	38·6	20·3
Herpestes	13 14	7 6	3	26	7 or 8	9	4·4	7·6	6·3	1·9	20·2	
Herpestes vitticollis	13	7	3	23?	7	9	6·5	12·5	9·6	2·9	31·5	31·0
Bdeogale	14	6	3	25	8	9	...	...	...	...	29·0	26·0
Cynictis	13	7	3	25	7	9	6·0	8·3	7·6	1·9	23·8	22·2
Crossarchus obscurus	14	6	3	20	7 or 8	9	5·1	9·2	6·0	2·5	22·8	17·9
Crossarchus fasciatus	14	6	3	24	......	......	4·8	9·85	7·0	2·5	24·15	?
Suricata	14	6	3	20	7	9	4·1	9·5	5·4	1·9	20·9	18·2
Galidictes	14	6	3	27	......	9	4 9	9·5	6·3	1·8	22·5	
Galidia	13	7 6	3	25	7	9	4·8	8·8	7·8	2·0	23·4	?
Hemigalidia	13	7	3	26	7	9	4·4	8·9	7·6	2·3	23·2	20·8
Eupleres	13	7	3	22	8	......	7·6	11·8	10·8	2·9	33·1	22·5
Cryptoprocta	13	7	3	29	......	9	11·4	19·7	17 1	3·8	52·0	68·6
Proteles	15	5	3	22	6	8	16·5	20·3	10·15	3·2	50·15	27·3
Crocuta	15	5	4	19	7	8	24·1	39·4	15·2	7·6	86·3	31·0

	Length of scapula.	Breadth of scapula.	Angle of spine and axillary margin.	Length of humerus.	Length of radius.	Length of manus.	Length of 3rd metacarpal.	Length of 3rd digit.	Length of ungual phalanx.	Length of pelvis.	Length of femur.	Length of tibia.	Length of os calcis.	Length of pes (in front of tibia).	Length of 4th metatarsal.	Length of 4th digit.	Length of entire pectoral limb.	Length of entire pelvic limbs.
Viverra	″9·4	″5·3	°25	″10·2	″9·4	″7·6	″3·3	″3·15	″0·85	″11·7	″12·1	″12.5	″3·0	″10·2	″5·1	″5·0	″27·2	″34·8
Viverricula	5·2	……	……	6·5	5·3	4·4	2·5	……	……	6·9	7·7	7·4	2·0	7·0	3·4	……	16·2	22·1
Fossa	5·3	2 65	25	6·75	6·75	5·1	2·4	1·9	0·65	7·5	8·0	8·9	2·2	7·1	3·8	?	18·6	24·0
Genetta	4·0	2·5	25	6·6	5·4	4·6	1·8	2·0	0·5	5·2	7·6	7·9	1·9	6·5	3·0	2·3	16·6	22·0
Genetta felina	5·8	3·8	25	8·1	7·1	5·1	2·0	2·3	0·55	7·1	9·1	9·6	2·0	7·1	3·8	2·5	20·3	25·8
Paradoxurus	5·2	3·3	25	7·5	5·7	5·0	1·75	2·5	0·5	6·8	8·3	7·7	2·0	6·5	2·3	2·4	18·2	22·5
Hemigalea	5·45	3·1	25	7·6	6·5	4·8	1·8	2·3	0·65	6·6	8·9	8·3	1·8	6·1	2·8	2·3	18·9	23·3
Nandinia	3·3	2·3	26	5·8	4·7	4·55	1·5	2·3	0·5	5·6	7·1	7·1	2·0	6·3	2·5	2·5	15·0	20·5
Arctictis	7·85	5·6	25	14·0	11·7	9·1	3·0	……	……	12·7	14·7	13·45	4·0	10·9	4·3	……	34·8	39·0
Cynogale	6·3	3·65	25	8·5	6·65	6·30	1·65	3·3	0·55	8·0	10·0	8·8	2·8	7·65	3·1	2·8	21·3	26·4
Herpestes	2·5	1·5	20	3·5	3·0	3·9	1·5	1·9	0·65	4·0	4·5	4·7	1·5	4·5	2·3	1·8	10·4	13·7
Herpestes vitticollis	5·5	2·6	25	7·1	6·6	6·1	2·15	2·15	1·0	6·85	8·0	8·0	2·1	7·5	3·45	2·85	19·8	23·5
Bdeogale	……	……	……	6·0	5·45	……	……	……	……	……	6·8	7·2	……	……	……	……	……	……
Cynictis	4·5	1·9	20	5·2	4·8	4·2	1·9	2·15	0·9	4·7	5·8	6·2	1·5	5·8	2·8	2·0	14·2	17·8
Crossarchus obscurus	3·5	2·3	26	4·7	4·0	4·0	1·5	2·0	0·9	5·1	5·3	5·3	1·5	5·1	2·3	1·5	12·7	15·7
Crossarchus fasciatus	4·0	2·0	……	5·1	4·55	4·55	……	……	……	5·45	6·1	6·7	2·2	6·1	……	……	14·1	18·9
Suricata	3·8	2·0	20	5·0	4·6	4·3	1·65	2·0	1·0	5·1	5·6	5·85	1·5	5·3	2·4	1·8	13·9	16·7
Galidictis	3·7	1·9	20	5·3	4·95	3·0	1·7	1·8	0·65	5·1	5·8	6·55	1·5	5·7	2·7	2·4	13·2	18·0
Galidia	3·5	1·9	……	5·1	4·5	……	……	……	……	4·6	5·9	?	……	……	……	……	……	……
Hemigalidia	4·0	2·0	25	5·2	5·1	4·0	1·65	2·0	0·70	6·3	6·1	6·6	1·5	5·8	2·7	2·2	14·3	18·5
Eupleres	5·3	2·5	24	6·1	6·7	5·1	2·0	2·3	0·8	6·85	7·6	7·8	1·8	6·7	2·8	2·5	17·9	22·1
Cryptoprocta	8·4	4·8	25	11·9	9·2	8·6	3·0	4·0	1·25	10·1	14·7	12·95	3·5	10·4	4·3	4·3	29·7	38·0
Proteles	9·9	4·8	20	12·45	12·7	12·0	6·3	4·2	1·25	10·7	13·3	13·2	3·3	12·45	6·3	4·2	37·1	38·9
Crocuta	17·8	12·0	30	19·0	21·0	17·8	8·9	6·3	2·0	12·45	22·8	17·8	6·0	14·0	7·1	6·3	57·8	54·6

	Length from front of lower canine to back of mandibular condyle.	Length from front of lower canine to back of last lower molar.	Interorbital breadth at narrowest part.	Interorbital breadth.	Breadth of brain-case.	Length of each zygomatic arch in straight line.	Its breadth.	Length of meso-pterygoid fossa.	Basion to ovalion.	From præmaxillæ to palatine foramina.	Greatest length of palate.	Its length behind last molars.	Breadth of palate.	Width of zygomata.	*Basion* to præ-maxillæ.
Viverra civetta	9″·5	6″·2	1″·9	2″·4	3″·7	3″·7	1″·5	2″·4	3″·2	2″·8	7″·2	0″·7	3″·7	7″·3	13″·4
Viverricula	5·7	3·6	1·2	1·3	2·7	2·2	0·6	1·45	2·3	1·8	4·2	0·45	2·4	4·55	8·3
Fossa	6·7	4·4	1·3	1·6	3·3	2·4	0·7	1·7	2·1	2·0	5·2	0·5	2·3	4·5	9·1
Genetta	5·5	3·5	1·5	0·7	2·7	2·2	0·8	1·5	2·1	1·8	4·0	0·4	2·5	4·1	8·0
Prionodon	4·9	2·9	1·2	1·4	2·3	1·9	0·5	1·3	1·6	1·35	3·6	0·7	1·8	3·8	7·2
Poiana	......	......	1·3	1·1	2·3	1·8	0·5	1·2	1·7	1·4	3·0	0·3	1·7	3·6	6·4
Paradoxurus	7·3	4·2	1·2	1·7	3·25	3·1	0·95	1·9	2·0	2·0	4·75	0·4	2·8	5·7	9·3
Arctogale	7·8	4·2	1·7	1·9	3·4	3·2	0·6	1·5	2·2	2·2	5·9	1·5	2·3	5·8	10·1
Hemigalea	......	......	1·5	1·7	3·1	2·5	0·8	1·6	2·0	1·4	4·9	0·4	2·5	4·7	8·8
Nandinia	5·6	3·2	1·4	1·5	2·9	2·3	0·7	1·6	2·0	1·7	3·7	0·2	2·1	4·4	7·5
Arctictis	10·1	5·1	3·8	3·3	4·5	4·4	1·8	2·2	3·5	2·9	7·8	2·6	3·5	8·2	13·9
Cynogale	8·5	5·8	1·4	1·6	3·7	3·2	0·8	1·6	2·7	1·5	6·2	0·6	2·1	6·2	11·4
Herpestes	......	......	1·1	1·5	2·8	2·0	0·7	1·1	2·1	1·2	4·5	1·2	2·2	4·3	7·8
Herpestes vitticollis	6·4	4·1	1·5	2·0	3·5	2·2	0·7	1·0	2·1	2·2	5·55	1·2	2·8	5·0	9·0
Bdeogale	......	......	......	......	......	......	......	......	......	......	4·9	......	......	......	7·8
Cynictis	4·3	3·0	1·6	1·6	2·8	1·6	0·7	1·0	1·6	1·1	3·5	0·8	2·1	4·0	6·3
Crossarchus obscurus	4·5	2·7	1·3	1·5	2·7	1·8	0·6	0·8	1·5	1·2	4·0	1·1	1·9	3·9	6·5
Rhinogale	......	......	2·2	1·8	3·1	2·1	1·0	1·5	1·9	1·5	4·5	0·6	2·3	4·7	8·0
Suricata	4·2	2·5	1·9	1·5	2·9	1·6	0·6	0·7	1·1	1·3	3·2	0·6	2·1	5·1	5·7
Galidictis	4·4	2·7	1·3	1·5	2·9	1·8	0·7	1·4	1·7	1·0	3·0	0·3	2·0	4·2	6·2
Galidia	4·0	2·5	1·4	1·6	2·8	1·5	0·7	1·0	1·8	1·1	2·7	0·4	2·1	4·1	5·8
Hemigalidia	4·4	2·8	1·5	1·7	2·7	1·9	0·7	1·2	1·9	1·4	3·3	0·4	1·9	3·9	6·6
Eupleres	5·6	3·4	1·4	1·4	3·1	2·0	0·5	1·5	1·8	1·9	4·0	0·4	1·3	3·5	7·7
Cryptoprocta	8·4	4·9	2·5	2·6	4·3	2·9	1·2	2·4	2·9	2·9	6·0	0·6	3·5	7·2	11·4
Proteles	8·9	3·3	1·8	2·3	3·8	3·8	0·9	2·3	3·7	2·5	7·0	2·8	3·8	8·6	13·4
Hyæna striata			3·8	4·9	5·8	5·0	2·0	4·0	4·5	5·1	11·4	1·1	7·0	15·0	20·1
Hyæna brunnea			4·4	5·6	5·9	5·5	2·6	4·8	4·6	5·4	12·3	1·0	8·3	18·2	21·8
Crocuta			4·0	5·6	8·1	5·4	3·0	4·4	5·2	4·5	12·7	1·4	11·1	18·3	22·5

	Length of upper canine.	Length of $\underline{\text{M. 2.}}$	Breadth of $\underline{\text{M. 2.}}$	Length of $\underline{\text{M. 1.}}$	Breadth of $\underline{\text{M. 1.}}$	Length of $\underline{\text{P. 4.}}$	Breadth of $\underline{\text{P. 4.}}$	Vertical extent of $\underline{\text{P. 4.}}$	Length of $\underline{\text{P. 3.}}$	Breadth of $\underline{\text{P. 3.}}$	Vertical extent of $\underline{\text{P. 3.}}$	Length of $\underline{\text{P. 2.}}$	Breadth of $\underline{\text{P. 2.}}$	Vertical extent of $\underline{\text{P. 2.}}$	Length of $\underline{\text{P. 1.}}$	Breadth of $\underline{\text{P. 1.}}$	Vertical extent of $\underline{\text{P. 1.}}$	Length of outer-most incisors.	Length of inner-most incisors.	Length of upper molar series.
Viverra	1″·7	0″·4	0″·8	0″·7	1″·3	1″·5	0″·9	0″·9	0″·8	0″·5	0″·7	0″·8	0″·4	0″·7	0″·3	0″·3	0″·4	0″·7	0″·5	4″·6
Viverricula	1·0	0·2	0·3	0·4	0·65	0·7	0·55	0·5	0·5	0·25	0·4	0·5	0·2	0·4	0·2	0·1	0·3	0·4	0·3	2·6
Fossa	1·2	0·4	0·5	0·5	0·7	0·8	0·6	0·45	0·6	0·3	0·35	0·5	0·2	0·35	0·3	0·15	0·3	0·3	0·15	3·5
Genetta	0·9	0·1	0·3	0·3	0·7	0·8	0·5	0·5	0·5	0·2	0·4	0·5	0·2	0·4	0·2	0·1	0·2	0·3	0·2	2·7
Prionodon	0·8	0·0	0·0	0·2	0·4	0·6	0·3	0·5	0·45	0·2	0·3	0·35	0·15	0·3	0·25	0·15	0·25	0·3	0·2	2·2
Poiana	0·9	0·0	0·0	0·2	0·4	0·6	0·4	0·3	0·5	0·2	0·3	0·4	0·2	0·3	0·1	0·1	0·2	0·3	0·2	...
Paradoxurus	1·4	0·3	0·4	0·5	0·8	0·7	0·7	0·4	0·55	0·35	0·5	0·5	0·25	0·45	0·2	0·15	0·3	0·5	0·35	3·2
Arctogale	1·2	0·3	0·3	0·4	0·5	0·5	0·4	0·4	0·4	0·3	0·4	0·4	0·2	0·4	0·1	0·1	0·2	0·4	0·3	2·9
Hemigalea	1·1	0·4	0·4	0·5	0·7	0·6	0·6	0·3	0·6	0·4	0·4	0·5	0·2	0·5	0·3	0·2	0·4	0·4	0·3	...
Nandinia	?	0·1	0·2	0·3	0·4	0·7	0·45	0·4	0·5	0·3	0·4	0·4	0·2	0·4	0·2	0·1	0·3	?	?	2·6
Arctictis	1·7	0·0	0·0	0·6	0·7	0·7	0·7	0·5	0·6	0·6	0·5	0·5	0·3	0·5	0·2	0·2	0·5	0·5	0·4	3·0
Cynogale	1·5	0·6	0·7	0·6	0·8	0·9	0·8	0·5	0·9	0·4	0·6	0·9	0·3	0·6	0·4	0·3	0·6	0·5	0·3	4·5
Herpestes vitticollis	1·2	0·25	0·6	0·5	0·9	0·9	0·65	0·5	0·6	0·45	0·55	0·5	0·3	0·45	0·2	0·15	0·2	0·5	0·5	3·0
Cynictis	0·9	0·2	0·4	0·3	0·6	0·7	0·5	0·4	0·4	0·4	0·4	0·4	0·2	0·4	0·1	0·1	0·3	0·4	0·3	1·9
Crossarchus obscurus	0·7	0·2	0·5	0·3	0·5	0·4	0·4	0·3	0·3	0·3	0·3	0·3	0·2	0·3	0·0	0·0	0·0	0·3	0·2	1·8
Rhinogale	1·0	0·3	0·5	0·4	0·6	0·6	0·6	0·3	0·4	0·4	0·4	0·4	0·3	0·4	0·1	0·1	0·2	0·5	0.3	...
Suricata	0·9	0·2	0·4	0·3	0·6	0·5	0·6	0·3	0·3	0·3	0·5	0·3	0·2	0·5	0·0	0·0	0·0	0·4	0·3	1·7
Galidictis	1·1	0·2	0·3	0·3	0·6	0·7	0·5	0·4	0·5	0·3	0·4	0·3	0·2	0·3	0·0	0·0	0·0	0·6	0·4	1·7
Galidia	0·8	0·1	0·3	0·3	0·6	0·8	0·4	0·4	0·4	0·2	0·3	0·2	0·1	0·2	0·0	0·0	0·0	0·3	0·2	...
Hemigalidia	0·8	0·25	0·4	0·3	0·6	0·6	0·4	0·4	0·4	0·25	0·4	0·4	0·2	0·4	0·2	0·1	0·2	0·4	0·25	1·7
Eupleres	0·3	0·3	0·3	0·4	0·3	0·5	0·2	0·2	0·4	0·1	0·3	0·3	0·1	0·2	0·2	0·1	0·2	0·25	0·19	2·9
Cryptoprocta	1·7	0·0	0·0	0·3	0·8	1·5	0·7	0·9	0·8	0·5	0·7	0·6	0·3	0·5	?	?	?	0·9	0·5	3·6
Proteles	0·9	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·4	0·2	0·2	0·4	0·3	0·4	0·2	0·3	0·2	0·4	0·3	2·0
Hyæna striata	3·0	0·0	0·0	0·5	1·3	3·1	1·7	1·8	1·9	1·3	1·8	1·4	1·0	1·3	0·7	0·6	0·8	1·6	0·7	7·0
Hyæna brunnea	3·2	0·0	0·0	0·6	1·3	3·5	2·2	2·0	2·2	1·7	2·1	1·7	1·1	1·2	0·6	0·6	0·6	1·6	0·9	
Crocuta	3·2	0·0	0·0	0·3	0·4	3·7	2·0	2·2	2·4	...	2·6	1·5	1·0	1·2	0·7	0·7	0·8	2·1	1·0	

Proportion of parts of skeleton, the length from the atlas to the end of the sacrum being taken as 100.

	Cervical region.	Dorsal region.	Lumbar region.	Sacrum.	Tail.	Scapula.	Humerus.	Radius.	Manus.	3rd metacarpal.	3rd digit.	Ungual phalanx.	Humerus + radius + manus.	Femur + tibia + pes.
Viverra	25·8	36·5	29·4	8·1	82·8	15·0	16·3	15·0	12·0	5·2	5·0	1·3	43·3	55·6
Viverricula	27·4	36·6	28·2	7·5	87·1	13·6	17·0	13·8	11·5	6·5	......	......	42·3	57·7
Genetta	25·3	35·5	30·7	8·3	151·0	14·4	23·9	19·5	16·6	6·5	7·2	1·8	60·0	79·6
Genetta	26·5	34·4	31·2	7·8	106·1	14·2	19·9	17·4	12·5	4·9	5·6	1·3	49·8	63·2
Paradoxurus	25·2	43·8	29·1	7·8	122·5	15·6	22·5	17·1	15·0	5·2	7·5	1·5	54·6	67·5
Hemigalea	28·3	35·4	29·3	6·9	92·1	15·2	21·2	18·1	13·4	5·0	6·4	1·8	52·7	64·9
Nandinia	19·5	36·9	34·4	9·0	153·9	11·9	21·0	17·0	16·4	5·4	8·3	1·8	54·4	74·2
Arctictis	18·8	44·8	27·2	9·1	146·4	14·0	25·0	20·9	16·3	5·3	......	......	62·2	69·9
Cynogale	26·6	43·1	25·0	5·1	52·5	16·3	22·0	17·2	16·3	4·2	8·5	1·4	55·5	68·4
Herpestes vitticollis	20·6	39·7	30·4	9·2	98·4	17·7	22·5	20·9	19·3	7·1	7·1	3·1	62·7	75·9
Bdeogale	......	......	......	......	89·6	......	20·7	18·6	......	......	......	......	......	......
Cynictis	25·2	34·8	31·8	7·9	93·2	18·9	21·8	20·1	17·6	7·9	9·0	3·7	59·5	74·6
Crossarchus obscurus	22·3	40·3	26·3	10·9	78·5	15·3	20·6	17·5	17·5	6·5	8·7	3·9	55·6	68·7
Crossarchus fasciatus	19·8	40·7	28·9	10·3	......	16·5	21·1	18·8	18·8	......	......	......	58·7	78·1
Suricata	19·6	45·4	25·8	9·0	8·7	13·3	23·9	22·0	20·5	7·8	9·5	4·5	66·4	79·9
Galidictis	21·7	42·2	28·0	8·0	......	16·4	23·5	22·0	13·3	7·5	8·0	2·8	58·8	80·1
Galidia	20·5	37·6	33·3	8·5	......	14·9	21·7	19·2	......	......	......	......	......	......
Hemigalidia	19·0	38·3	32·7	9·9	89·6	17·2	22·4	21·9	17·2	7·1	8·6	3·0	61·5	79·6
Eupleres	22·9	35·6	32·6	8·7	67·9	16·0	18·1	20·2	15·4	6·0	6·9	2·4	53·7	66·6
Cryptoprocta	21·9	37·8	32·8	7·3	112·6	16·1	22·8	17·6	16·5	5·7	7·6	2·2	56·9	73·1
Proteles	32·9	40·4	20·2	6·3	54·4	19·7	24·8	25·3	23·9	12·5	8·3	2·4	74·0	77·6
Crocuta	27·9	45·6	17·6	8·8	35·9	20·6	22·0	24·3	20·6	10·3	7·3	2·3	66·9	63·2

Proportion of parts of skeleton, the length from the atlas to the end of the sacrum being taken as 100.

	Pelvis (length).	Femur.	Tibia.	Pes.	Os calcis.	Fourth metatarsal.	Cranial length.	Length of palate.	Breadth of palate.	Basion to ovalion.	Breadth of zygomata.	Breadth of brain-case.	Interorbital breadth.	Postorbital breadth.	Length of $\underline{\text{M. 1.}}$	Length of $\underline{\text{P. 4.}}$
Viverra	18·7	19·3	20·0	16·3	4·8	8·1	21·4	11·5	5·9	5·1	11·7	5·9	3·8	3·0	1·1	2·4
Viverricula	18·0	20·1	19·3	18·3	5·2	8·9	21·7	10·9	6·2	6·0	11·9	7·0	3·4	3·1	1·0	1·8
Genetta	18·8	27·5	28·6	23·5	6·8	10·8	28·9	14·4	9·0	7·6	14·8	9·7	2·5	5·4	1·0	2·8
Genetta	17·4	22·3	23·5	17·4	4·9	9·3										
Paradoxurus	20·4	24·9	23·1	19·5	6·0	6 9	27·9	14·2	8·4	6·0	17·1	9·7	5·1	3·6	1·5	2·1
Hemigalea	18·4	24·8	23·1	17·0	5·0	7·8	24·5	13·6	6·9	5·5	13·1	8·6	4·7	4·1	1·3	1·6
Nandinia	20·2	25·7	25·7	22·8	7·2	9·0	27·1	13·4	7·6	7·2	15·9	10·5	5·4	5·0	1·0	2·5
Arctictis	22·7	26·3	24·1	19·5	7·1	7·7	24·9	13·9	6·2	6·2	14·6	8·0	5·9	6·8	1·17	1·2
Cynogale	20·7	25·9	22·7	19·8	7·2	8·0	29·5	16·0	5·4	6·9	16·0	9·5	4·1	3·6	1·5	2·3
Herpestes	21·7	25·3	25·3	25·3	6·6	10·9	28·5	17·9	8·8	6·6	15·8	11·1	6·3	4·7	1·5	2·8
Bdeogale	......	23·4	24·8	......	......	......	26·9	16·9								
Cynictis	19·7	24·3	26·0	24·3	6·3	11·7	26·4	14·7	8·8	6·7	16·8	11·7	6·7	6·7	1·2	2·9
Crossarchus obscurus .	22·3	23·2	23·2	22·3	6·5	10·0	28·5	17·5	8·3	6·5	17·1	11·8	6·5	5·7	1·3	1·7
Crossarchus fasciatus .	22·5	25·2	27·7	25·2	9·1											
Suricata	24·4	26·7	27·9	25·3	7·1	11·4	27·2	15·3	10·0	5·2	24·4	13·8	7·1	9·0	1·4	2·3
Galidictis	22·6	25·7	29·1	25·3	6·6	12·0	27·5	13·3	8·8	7·5	18·6	12·8	6·6	5·7	1·3	3·1
Galidia	19·6	25·2	......	......	......	......	24·7	11·5	8·9	7·6	17·0	11·9	6·8	5·9	1·2	3·4
Hemigalidia	27·1	26·2	28·4	25·0	6·4	11·6	28·4	14·2	8·1	8·1	16·8	11·6	7·3	6·4	1·2	2·5
Eupleres	20·6	22·9	23·5	20·2	5·4	8·4	23·2	12·0	3·9	5·4	10·5	9·3	4·2	4·2	1·2	1·5
Cryptoprocta	19·4	28·2	24·9	20·0	6·7	8·2	21·9	11·5	6·7	5·5	13·8	8·2	5·0	4·8	0·5	2·8
Proteles	21·3	26·5	26·3	24·8	6·5	12·5	26·7	13·9	7·5	7·3	17·1	7·5	4·5	3·5		
Crocuta	14·4	26·4	20·6	16·2	6·9	8·2	26·0	14·7	12·8	6·0	21·2	9·3	6·4	4·6	0·3	4·2

Proportions of the skull and teeth, the length from basion to front of præmaxillæ being taken as 100.

	Breadth of zygomata.	Breadth of palate.	Length of palate behind molars.	Length of palate.	Length of mesopterygoid fossa.	Breadth of mesopterygoid fossa.	Breadth of brain-case.	Interorbital breadth.	Narrowest post-orbital breadth.	Length of upper canine.	Length of outermost incisor.	Length of innermost incisor.	Length (antero-posterior) of $\underline{\text{M. 2.}}$	Breadth of $\underline{\text{M. 2.}}$	Length of $\underline{\text{M. 1.}}$	Breadth of $\underline{\text{M. 1.}}$	Length of $\underline{\text{P. 4.}}$	Breadth of $\underline{\text{P. 4.}}$	Length of $\underline{\text{P. 3.}}$	Breadth of $\underline{\text{P. 3.}}$	Basion to ovalion.
Viverra	54·4	27·6	5·2	53·7	17·9	11·1	27·6	17·9	14·1	12·6	5·2	3·7	2·9	5·9	5·2	9·7	11·1	6·7	5·9	3·7	23·8
Viverricula	54·8	23·9	5·4	50·6	17·4	7·2	33·4	15·6	14·4	12·0	4·8	3·6	2·4	3·6	4·8	7·8	8·4	6·6	6·0	3·0	27·7
Fossa	49·4	25·2	5·4	57·1	18·6	7·6	36·2	17·5	14·2	13·1	3·2	1·6	4·3	5·4	5·4	7·6	8·6	6·5	6·5	3·2	23·0
Genetta	51·6	31·2	5·0	50·0	18·7	9·9	33·7	8·7	18·7	11·2	3·7	2·5	1·2	3·7	3·7	8·7	9·9	6·2	6·2	2·5	26·2
Prionodon	52·7	25·0	9·7	50·8	18·0	6·9	31·9	19·4	16·6	11·1	4·1	2·7	......	......	2·7	5·5	8·3	4·1	6·2	2·7	22·2
Poiana	56·2	26·5	4·6	46·8	18·7	7·8	35·9	17·1	20·3	14·0	4·6	3·1	......	......	3·1	6·2	9·3	6·2	7·8	3·1	26·5
Paradoxurus	61·2	30·1	4·3	51·0	20·4	9·1	33·8	18·2	12·9	15·0	5·3	3·7	3·2	4·3	5·3	8·6	7·5	7·5	5·9	3·7	21·5
Arctogale	57·4	22·7	14·8	58·4	14·8	5·9	33·6	18·7	16·8	11·8	3·9	2·9	2·9	2·9	3·9	4·9	4·9	3·9	3·9	2·9	21·7
Hemigalea	53·4	28·4	4·5	55·6	18·1	9·1	35·2	19·3	17·0	12·5	4·5	3·2	4·5	4·5	5·6	7·9	6·8	6·8	6·8	4·5	22·7
Nandinia	58·6	28·0	2·6	49·3	21·3	9·3	38·6	20·0	18·6	?	......	......	1·3	2·6	4·0	5·3	9·3	6·0	6·6	4·0	26·0
Arctictis	58·9	25·1	18·7	56·1	15·8	12·9	32·3	23·7	27·3	12·2	3·5	2·8	......	......	4·3	5·0	5·0	5·0	4·3	4·3	25·1
Cynogale	54·3	18·4	5·2	54·3	14·0	7·0	32·4	14·0	12·2	13·1	4·3	2·6	5·2	......	5·2	7·0	7·8	7·0	7·8	3·5	23·6
Herpestes	52·8	28·2	15·3	56·4	14·1	21·7	35·7	19·2	14·1	......	......	......	......	......	......	......	......	......	......	......	26·9
Herpestes vitticollis	44·4	31·1	13·3	61·6	11·1	7·7	38·8	22·2	16·6	13·3	4·4	4·4	2·7	6·6	4·4	10·0	10·0	7·2	6·6	5·0	23·3
Bdeogale	......	......	......	62·8																	
Cynictis	63·4	33·3	12·7	55·5	15·8	11·1	44·4	25·3	25·3	14·2	6·3	4·7	3·1	6·3	4·7	9·5	11·1	7·9	6·3	6·3	25·3
Crossarchus obscurus	60·0	29·2	16·9	61·5	12·3	9·2	41·5	23·0	20·0	10·7	4·6	3·0	3·0	7·6	4·6	7·6	6·1	6·1	4·6	4·6	23·0
Rhinogale	58·7	28·7	7·5	56·2	18·7	12·5	38·7	22·5	27·5	12·5	6·2	3·7	3·7	6·2	5·0	7·5	7·5	7·5	5·0	5·0	23·7
Suricata	89·4	36·8	10·5	56·1	12·2	10·5	50·8	26·3	33·3	15·7	7·0	5·2	3·5	7·0	5·2	10·5	8·7	10·5	5·2	5·2	19·3
Galidictis	67·7	32·2	4·8	48·4	22·5	11·2	46·7	24·1	20·9	17·7	9·6	6·4	3·2	4·8	4·8	9·6	11·2	8·0	8·0	4·8	27·4
Galidia	70·6	36·2	6·8	46·5	17·2	12·0	48·2	27·5	24·1	13·7	5·1	3·4	1·7	5·1	5·1	10·3	13·7	6·8	6·8	3·4	31·1
Hemigalidia	59·0	28·7	5·0	50·0	18·4	10·6	40·9	25·7	22·7	12·1	5·0	3·7	3·7	5·0	4·5	9·0	9·0	5·0	5·0	5·0	28·7
Eupleres	45·4	16·8	5·1	51·9	19·4	6·4	40·2	18·1	18·1	3·8	3·2	2·4	3·8	3·8	5·1	3·8	6·4	2·5	5·1	1·3	23·3
Cryptoprocta	63·1	30·7	5·2	52·6	21·0	10·5	37·7	22·8	21·0	14·0	7·8	4·3	......	......	2·6	7·0	13·1	6·1	7·0	4·3	25·4
Proteles	64·1	28·3	20·8	52·2	17·1	6·7	28·3	17·1	13·4	6·7	2·9	2·2	......	......	......	......	......	......	2·9	1·4	27·6
Hyæna striata	74·1	34·8	5·4	56·7	19·9	9·9	28·8	24·3	18·9	14·9	7·9	3·4	......	......	2·4	6·4	15·4	8·4	9·4	6·4	22·3
Hyæna brunnea	83·4	38·0	4·5	56·4	22·0	11·9	27·0	25·6	20·1	14·6	7·3	4·1	......	......	2·7	5·9	16·0	10·0	10·0	7·7	21·1
Crocuta	81·3	49·3	6·2	56·4	19·1	13·3	36·0	24·3	17·7	14·2	9·3	4·4	......	......	1·3	1·7	16·4	8·8	10·6	......	23·1

	Extreme length of skull being taken as 100, length:—			
	Space from front of lower canine to back of last lower molar.	Space from front of lower canine to back of condyle.	Upper molar series.	Proportion borne by the pelvic limb (femur, tibia, and pes) to the entire pectoral limb, taken as 100.
Viverra	49·2	39·4	38·3	133·9
Viverricula	49·3	48·4	38·3	130·4
Fossa	49·3	37·4	38·4	130·9
Genetta	49·7	48·7	39·7	132·5 or 137·0
Prionodon	49·2	48·4	38·5	—
Poiana	—	—	—	—
Paradoxurus	45·1	37·4	38·4	130·6
Arctogale	45·5	[illegible]	39·7	—
Hemigalea	—	—	—	130·2
Nandinia	39·4	37·6	38·6	130·6
Arctictis	39·4	[illegible]	[illegible]	[illegible]
Cynogale	39·5	[illegible]	38·4	130·9
Herpestes	—	—	—	[illegible]
Herpestes vitticollis	[illegible]	[illegible]	[illegible]	[illegible]
Bdeogale	—	—	—	—
Crossarchus	[illegible]	[illegible]	[illegible]	[illegible]
Crossarchus [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Rhinogale	—	—	—	—
Suricata	[illegible]	[illegible]	[illegible]	[illegible]
Galidictis	[illegible]	[illegible]	[illegible]	[illegible]
Galidia	[illegible]	[illegible]	—	—
Hemigalidia	[illegible]	[illegible]	[illegible]	[illegible]
Eupleres	[illegible]	[illegible]	[illegible]	[illegible]
Cryptoprocta	[illegible]	[illegible]	[illegible]	[illegible]
Proteles	[illegible]	[illegible]	[illegible]	[illegible]
Hyæna striata		—	[illegible]	—
Hyæna brunnea		—	—	—
Crocuta		—	—	[illegible]

Proportions of the skull and teeth, the line from the basion to the ovalion being taken as 100.

	Length of palate.	Breadth of palate.	From præmaxillæ to palatine foramina.	Breadth of zygomata.	Breadth of brain-case.	Length of $\underline{\text{M. 1}}$.	Breadth of $\underline{\text{M. 1}}$.	Length of $\underline{\text{P. 4}}$.	Breadth of $\underline{\text{P. 4}}$.	Length of $\underline{\text{P. 3}}$.	Breadth of $\underline{\text{P. 3}}$.
Viverra	225·0	115·6	87·5	228·1	115·6	21·8	40·5	43·4	28·1	25·0	15·6
Viverricula	182·6	104·3	78·2	197·8	117·3	17·3	28·2	30·4	23·9	21·7	10·8
Fossa	247·6	109·5	95·2	214·2	157·1	23·8	33·3	38·1	28·5	28·5	14·2
Genetta	190·4	119·0	85·7	195·2	128·5	14·2	33·3	38·1	23·8	23·8	9·5
Prionodon	225·0	112·5	84·3	237·5	143·7	12·5	25·0	37·5	18·7	28·1	12·5
Poiana	176·4	100·0	82·3	211·7	135·3	11·7	23·5	35·3	23·5	29·4	11·7
Paradoxurus	237·5	140·0	100·0	285·0	162·5	20·0	40·0	35·0	35·0	27·5	17·5
Arctogale	268·2	104·5	100·0	263·6	154·5	18·1	22·7	22·7	18·1	18·1	13·6
Hemigalea	245·0	125·0	70·0	235·0	155·0	25·0	35·0	30·0	30·0	30·0	20·0
Nandinia	175·0	105·0	85·0	220·0	145·0	15·0	20·0	35·0	22·5	25·0	15·0
Arctictis	222·8	100·0	82·8	234·2	128·5	17·1	20·0	20·0	20·0	17·1	17·1
Cynogale	229·6	77·7	55·5	229·6	137·0	22·2	29·6	33·3	29·6	33·3	14·8
Herpestes	214·2	104·7	57·1	204·7	133·3						
Herpestes vitticollis	264·2	133·3	104·7	238·1	166·6	23·8	42·8	42·8	30·9	28·5	21·4
Cynictis	218·7	131·4	68·7	249·9	175·5	18·7	37·5	43·7	31·2	24·9	24·9
Crossarchus obscurus	266·6	129·9	80·0	260·0	180·0	20·0	33·3	26·6	26·6	20·0	20·0
Rhinogale	236·8	121·0	78·9	247·3	163·1	21·0	31·5	31·5	31·5	21·0	21·0
Suricata	290·9	190·9	118·1	463·6	263·6	27·2	54·5	45·4	54·5	27·2	27·2
Galidictis	176·4	117·6	58·8	247·0	170·5	17·6	35·2	41·1	29·4	23·5	17·6
Galidia	150·0	116·6	61·1	227·7	155·5	16·6	33·3	44·4	22·2	22·2	11·1
Hemigalidia	173·6	100·0	73·6	205·2	142·1	15·6	31·5	31·5	21·0	21·0	13·1
Eupleres	222·2	72·2	105·5	194·4	172·2	22·2	16·6	27·7	11·1	22·2	5·5
Cryptoprocta	206·9	120·6	100·0	248·2	148·2	10·3	27·5	51·7	24·1	27·5	17·2
Proteles	189·1	102·7	67·5	232·4	102·7	......	......	......	......	10·8	5·4
Hyæna striata	253·3	155·5	113·3	333·3	128·8	11·1	28·8	68·8	37·7	42·2	29·8
Hyæna brunnea	267·3	180·4	117·3	395·6	128·2	13·0	28·2	76·0	47·8	47·8	36·9
Crocuta	242·2	213·4	86·5	351·9	155·7	5·7	7·6	71·1	38·4	46·1	

MYOLOGY.

The muscles of the *Felidæ* have, as every one knows, been most perfectly illustrated and described, with his peculiar nomenclature, by Straus-Dürckheim in his splendid work 'Le Chat.' The muscles of the Cat have also been shortly described under their commonly known names, and partly illustrated from fresh dissections, by me[1]. The muscles of various *Felidæ*, of the Genet, and of the Hyæna have been figured in Cuvier's magnificent 'Recueil des Planches.' The muscles of the Civet have been described by Prof. Macalister[2] and by Messrs. Young[3] and Davis[4], and those of *Crocuta* by Dr. Watson[5].

With these references, I shall content myself with shortly noticing the myological conditions which I have observed in the specimen of *Genetta tigrina* dissected by me, pointing out their resemblances and differences from those found by me in the Cat, by Prof. Macalister in the Civet, and by Dr. Watson in *Crocuta*.

Muscles of the Pectoral Limb.

Pectoralis.—I found this in the Genet to be as in the Cat, save that one muscular mass corresponds with what I have described[6] as the 1st, 2nd, and 5th parts of the Cat's *pectoralis*, while the part which seems to represent the Cat's 2nd portion extends three fourths down the humerus. What corresponds to the 4th part of the Cat's pectoral is here inserted into the head of the humerus around the tendon of the biceps, and (mainly) on the greater tuberosity.

In *Crocuta* the pectoral is inserted into the whole length of the humerus from the bicipital groove to the elbow, and is divisible into a superficial and a deep stratum.

The *rectus abdominis* extends the whole length of the sternum; and there are (as in the Civet) seven tendinous inscriptions.

The *scaleni* are as in the Cat, except that the longer one reaches from the 5th to the 8th rib: from the 3rd to the 6th in the Civet. There are but two scaleni in *Crocuta*, but there are three in *Hyæna brunnea* and the Civet.

The *subclavius* is represented by a small muscle which goes from the first rib to the rudimentary clavicle, as also in the Civet.

The *trapezius* has the same general conditions as it has in the Cat[7]. Its anterior part is very small in the Hyænas[8].

The *cephalo-humeral* is as in the Cat, as it is also probably in the Civets and Hyænas. In the latter it is of enormous strength[9].

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[1] Journ. of Anat. and Phys. vol. xiv. (1879) p. 166.

[2] Ibid. vol. ii. p. 205.

[3] See 'The Cat' (John Murray, 1881), chap. v.

[4] Proc. Roy. Irish Acad. n. s. vol. i. 1869–74, p. 506.

[5] P. Z. S. 1879, p. 79, pls. v. & vi. Some myological notes as to *Hyæna brunnea* have also been published by Dr. Murie in Trans. Zool. Soc. vii. p. 509.

[6] 'The Cat,' p. 145.

[7] Prof. Macalister reckons as part of the trapezius what I and Dr. Watson consider to be the cephalo-humeral (or levator humeri).

[8] "Opposite the last two cervical spines."

[9] Trans. Zool. Soc. vol. vii. p. 510.

The *rhomboideus* arises (as in the Civet) from the 3rd cervical to the 4th dorsal vertebra; in *Crocuta* from the 5th cervical to the 4th dorsal. There is no *rhomboideus capitis*, thus differing from the Cat and agreeing with *Crocuta*, though, according to Meckel, there is one in *Hyæna striata*.

The *serratus magnus* arises in the Cat from the first ten ribs, in the Genet from the first nine, in *Crocuta* from the first eight, and in the Civet from the first seven or eight.

The *levator anguli scapulæ* arises in the Cat from the last five cervical vertebræ, in the Genet and Civet from the last four[1], in *Crocuta* from the last five cervical and first dorsal vertebræ. It is enormously thick in the Hyænas.

The *levator claviculæ* is as in the Cat; also in *Crocuta*[2].

The *latissimus dorsi* I found to arise as in the Cat; while in the Civet it extends from the 5th dorsal to the 3rd lumbar vertebra. In the Hyænas it arises from the posterior eleven dorsal spines and the lumbar aponeurosis.

There is but one *dorso-epitrochlear*, which corresponds to my internal dorso-epitrochlear of the Cat. There is but one in the Civet and Hyænas.

The *deltoid*, *infraspinatus*, and *teres minor* are as in the Cat.

The *subscapularis* and *infraspinatus* are as in the Cat. The *supraspinatus* only differs from that of the Cat in that, as in the Civet, it is obscurely separable into two portions, and in that it projects less beyond the margin of the bone of the scapula.

The *teres major* in the Genet, Civet, and Hyænas is inserted into the tendon of the latissimus dorsi, rather than into the humerus in common with it as in the Cat.

The *triceps* of the Genet is substantially like that of the Cat, except that its fifth head of origin extends higher up the humerus. In *Crocuta* and *Viverra civetta* there are but four heads.

The *anconeus* is like that of the Cat, except that it is not larger than is the fifth head of the triceps. There is a short flat anconeus in *Crocuta*.

The *biceps* in the Genet (as in the Civet, the Cat, and the Hyænas) arises by a single head from the margin of the glenoid surface, and is inserted into the tubercle of the radius.

The *coracobrachialis* is as in the Cat, save that it (as also in the Civet) partly unites with the tendon of the latissimus dorsi and adjacent part of the triceps. It is also single in the Hyænas.

The *brachialis anticus* is as in the Cat, Civet, and Hyænas.

The *supinator longus* arises much lower down the humerus than in the Cat. It is inserted into the radius, but sends (as also in the Civet) a slip to the dorsal carpal ligament. It is absent in the Hyænas, or only represented by a tendinous vestige[3]. In *Hemi-*

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[1] Mr. Young says from the last six (Journ. of Anat. & Phys. vol. xiv. p. 169).

[2] Also in the Ichneumon, where it is said by Meckel (Anat. Comp. vol. vi. p. 238) to perforate the trapezius.

[3] P. Z. S. 1879, p. 98.

galea it is inserted into the large plate-like process of the radius, before described (fig. 2).

The *extensores carpi radiales longior et brevior* and the *supinator brevis* are as in the Cat and Civet.

The *extensor communis digitorum* supplies the four outer digits in the Hyænas and Civet, as in the Genet and Cat.

The *extensor minimi digiti* is substantially as in the Cat, and supplies the 3rd, 4th, and 5th digits in the Civet, but in the Hyænas it only goes to the 4th and 5th[1].

The *extensor longus ulnaris* is as in the Cat.

The *extensor ossis metacarpi pollicis* is as in the Cat, save that its origin extends up inside the olecranon. It is recorded as arising from the olecranon in the Civet (but not in the Hyænas), and as inserted into a sesamoid at the base of the first metacarpal according to Macalister[2], and exclusively into the metacarpal of the pollex according to Mr. Young.

The *extensores indicis et secundii internodii pollicis* are as in the Cat, save that their origin does not extend up to the olecranon. The *extensor s. i. pollicis* is wanting in the Hyænas, but present in the Civet, where it goes to the pollex and index.

The *pronator teres* is as in the Cat. In the Civet its insertion extends down to the lower end of the radius. It is shorter and more slender, relatively, in the Hyænas. In *Hemigalea* it is inserted into the singular plate-like process of the radius.

The *palmaris longus* is inserted into the palmar fascia, as in the Cat and Hyænas. In the Civet it is said to be large (more or less double) and inserted into the pisiforme. It is much united with the muscle next to be noticed in Hyænas and in the Cat.

The *flexor sublimis digitorum* is not blended with the palmaris longus, but is very small, and takes origin from part of the tendon of the *flexor profundus*, as also in the Civet. It goes to the four outer digits; and in *Crocuta* (where it seems yet more completely blended with the *flexor profundus*) it goes to the three middle digits[3], the fifth being supplied by a minute separate muscle[4]; as also in the Civet, which Mr. Young (*l. c.* p. 172) compares with my and Murie's "flexor brevis manus" of *Hyrax*[5].

The *flexor profundus digitorum* arises by five bellies, three from the condyle, one from the radius (as in the Cat), and one from the ulna. It has four origins in the Civet—1. condylo-ulnar, 2. condylo-radial, 3. radial, and 4. ulnar.

The *flexor carpi ulnaris* is as in the Cat, except that the two heads soon unite to form one belly. In the Civet the muscle is double, one part arising from the condyle and one from the olecranon; both are inserted into the pisiforme. In *Hyæna striata* and *Crocuta* it only arises from the inner condyle of the humerus.

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[1] Also in the Genet in Cuvier's Planches, pl. 126. fig. 1 ϵ′; and in the Hyæna, see pl. 129. fig. 1 ϵ′.

[2] Proc. Roy. Irish Acad. vol. i. 1869-74, p. 509.

[3] P. Z. S. 1879, p. 99.

[4] In *Hyæna striata* the accessory slips are altogether tendinous.

[5] It arises in the Civet from the annular ligament, pisiforme, and tendon of palmaris longus. See also Cuvier's 'Planches,' pl. 126. fig. 2, κ, σ.

The *flexor carpi radialis* is as in the Cat.

The *pronator quadratus* extends for about the lowest third of the length of the bones of the forearm (instead of half their length, as in the Cat). It extends for about the lowest quarter in the Civet, or a little more [1]. In *Hyæna striata* it is large; and in *Crocuta* it extends up the whole length of the bones of the forearm. It is very large in *Hemigalea*, and is inserted into the plate-like process of the radius.

The *lumbricales* in the Genet are as in the Cat. In the Civet there are sometimes but three [2], though there are four in *Hyæna* and *Crocuta*.

The *flexor brevis pollicis* arises by two heads in the Civet, and there is an *opponens*. There are no muscles furnished to the rudimentary pollex of the *Hyæninæ*.

The *abductor pollicis* arises in the Civet from the ulnar ossicle, and has a long tendon.

The *abductor minimi digiti* arises from the annular ligament and pisiform bone in the Civet, and it exists also in *Crocuta*. A second abductor arises in the Civet from inside the fifth metacarpal, and is inserted into the ulnar sesamoid of the fifth digit. There is also a second *flexor brevis minimi digiti* arising from the unciforme, and inserted beside the muscle previously mentioned.

The *interossei* in the Civet are said to be [3] as follows:—First, a (carpally arising) adductor indicis; secondly, a metacarpal adductor indicis; then an adductor annularis; fourthly, an adductor minimi digiti: the foregoing are palmar interossei. The dorsal interossei are:—First, an abductor indicis; secondly, an abductor medii digiti; thirdly, an adductor medii digiti; fourthly an adductor annularis: these are all bicipital except the third.

In *Crocuta* Dr. Watson says [4]:—"A deep set of interossei comprises eight fleshy bundles arranged in pairs, two to each metacarpal." "In addition to these paired muscles are two single ones (palmar interossei). These arise together from the bases of the third and fourth metacarpals. They are distributed to the middle and outermost digits respectively."

Muscles of the Pelvic Limb.

The *gluteus maximus*, *gluteus medius*, *gluteus minimus*, *tensor vaginæ femoris*, and *biceps femoris* are as in the Cat.

The accessory biceps or *tenuissimus* is in the Genet as in the Cat [5], except that it is slightly connected with the semitendinosus. In the Civet also it receives a slip, at its insertion, from the semitendinosus. In the *Hyæna* it descends at least to the middle of the leg[1]; Dr. Watson says to the os calcis in *Crocuta*.

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[1] Mr. Young says "lower third" (*l. c.* p. 171).

[2] Mr. Young (*l. c.* p. 172) found four.

[3] Macalister, Proc. Roy. Irish Acad. vol. i. (1869–74) p. 510.

[4] P. Z. S. 1879, p. 100.

[5] Cuvier says it only goes to the femur (Leçons d'Anat. Comp. i. p. 520).

The *semitendinosus* of the Genet (as also the Civet) has a delicate head, which arises from the third caudal vertebra at the hinder end of the caudal origin of the gluteus maximus, with which it is conterminous. This head joins the other part of the semitendinosus about one third down the femur, and becomes slightly connected with the tenuissimus. It is inserted as in the Cat, but the upper tendon of its insertion is not so distinct. This muscle has no caudal origin in *Crocuta*.

The *semimembranosus* is in the Genet quite as in the Cat, save that its two parts are more separate—separate for nearly the whole length of the muscle. The part from the ramus of the ischium goes to the femur; that from its tuberosity to the tibia. In *Crocuta* it is quite inseparable from the adductor magnus.

Agitator caudæ.—This muscle, which I did not observe in the Cat, arises in the Civet from the first and second caudal vertebræ, and is inserted into the back of the femur. In the Genet its origin blends with the hinder end of the caudal origin of the gluteus maximus. It is crossed by the sciatic nerve and goes to the lower third of the femur (rather behind its outer margin), and extends down almost to the external condyle.

In the Genet and Civet there is a special *sphincter* of the scent-glands.

The *sartorius* is double in the Genet and, sometimes at least, in the Civet[2]. One part arises from above and behind the anterior superior spine of the ilium and goes to the patella; the other part springs from below the first part, and is lost in the fascia on the inner side of the knee. It is also double in *Crocuta*.

The *pectineus* in the Genet is as in the Cat. It is large and double at its insertion in the Civet[3]. In *Crocuta* it goes from the ilio-pectineal line to the middle of the linea aspera.

The *adductor* mass of the Genet is substantially similar to that of the Cat, though, as in the Civet, it may be divided into three parts. One of these, the *adductor primus*, is attached to the semimembranosus[4]. Another, the *adductor secundus*, is very wide and short and is separable into two layers. The third part, or *adductor longus*, is attached halfway down the femur. In *Crocuta* there are two adductor muscles, which both arise from the pubic arch, and which are inserted, respectively, one into the internal condyle and internal tuberosity of femur, and the other into the whole length of the linea aspera and into the internal branch of its lower bifurcation.

The *quadriceps extensor* of the Genet is as in the Cat, save that the *crureus* takes origin along the whole length of the femur, up to the neck of that bone. The crureus is not differentiated in *Crocuta*, and the *vasti* are hardly separable.

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[1] Cuvier's 'Planches,' pl. 131.

[2] Mr. Young, *l. c.* p. 174, describes it as single.

[3] P. Z. S. 1879, p. 102.

[4] Not so in the Civet (Young, *l. c.* p. 174).

The *psoas magnus* and *iliacus* are as in the Cat.

The *psoas parvus* arises from the third, fourth, and fifth lumbar vertebræ, and (as in the Civet) is inserted into the pelvis by a very strong tendon.

The *pyriformis, gemelli, quadratus lumborum, quadratus femoris,* and the *obturators* are as in the Cat.

A muscle which I did not notice in the Cat exists in the Civet: it arises in front of and below a very distinct antero-posterior ridge on the dorsum of the ilium. It is called *gluteus quartus* by Professor Macalister.

Another muscle, which answers to my gluteus quartus in the Cat, is similarly conditioned to that of the Cat, both in *Genetta* and *Viverra.* It also exists in *Crocuta.* This muscle is called *gluteus quintus* by Professor Macalister.

The *plantaris* arises, in the Genet, only from the external condyle of the femur and the adjacent sesamoid bone, and is (as also in the Civet) only slightly united with the external head of the gastrocnemius. It is inserted as usual.

The *gastrocnemius* of the Genet has only three heads of origin—one from each femoral condyle and adjacent sesamoid, and one (mainly aponeurotic at its origin) from the fibula. There is no origin from the ligamentum patellæ. The insertion is as usual.

The *soleus* of the Civet is like that of the Cat. In the Genet it takes origin from the upper half of the fibula. Its insertion is as usual. It is wanting in *Hyæna striata* and in *Crocuta.*

The *popliteus* and *tibialis anticus* are both as in the Cat, and the same is the case with the Civet. In *Crocuta* it is double halfway down, the tendon of one part being inserted into the entocuneiforme, and that of the other into the rudimentary metatarsal of the hallux.

The *extensor longus digitorum* of the Genet is like that of the Cat. In the Civet it gives origin to two main tendons, which subdivide to supply the four outer digits, the details of the subdivision varying in different individuals. In *Hyæna striata* the muscle divides into two bellies and gives off five tendons. In *Crocuta* it seems to be single, and is said to give off no tendon to the digitus minimus.

The *extensor longus hallucis* is absent in *Crocuta* and in the Cat. In the Civet it is slender, arises from the upper half of the margin of the fibula, and goes to the hallux only. In the Genet it is also slender and has a similar origin, but appears to end distally in an aponeurotic expansion extending dorsally on the hallux and index.

The *peroneus longus* in the Civet and Genet is inserted into the fifth metatarsal as well as into the first metatarsal. In *Crocuta* and *Hyæna striata* it is inserted into the fifth metatarsal only.

The *peroneus brevis* and *peroneus quiniti digiti* are as in the Cat. The latter is wanting in *Crocuta,* but the former has two tendons.

The *extensor brevis digitorum* of the Genet and Civet is much as in the Cat, but ends distally in an aponeurotic expansion rather than in quite distinct tendons. It goes to the four outer or to the four inner digits. In *Hyæna* and *Crocuta* it only goes to the second, third, and fourth digits.

The *tibialis posticus* is as in the Cat.

The *flexor longus digitorum* and *flexor hallucis* of the Genet are like those of the Cat, save that a small tendon is sent to the hallux. There is no such tendon in the *Hyæninæ*.

The *flexor brevis digitorum* is in the Genet as in the Cat, save that it is not divided into four bellies side by side, but is in one mass[1]. In *Crocuta*[2] it is confined to the sole of the foot, and is represented solely by a tendon, there being no muscular belly. In *H. striata* (according to Meckel) it is a prolongation of the tendon of the plantaris with additional muscular fibres from the fourth metatarsal. In the Civet it seems to be similar, except that the additional muscular fibres are derived from the os calcis.

The *accessorius* of the Genet (and apparently of the Civet) is very unlike the muscle described by me under this name in the Cat[3]. It arises from the outer side of the os calcis, and ends in a strong tendon which joins obliquely the tendon of the deep flexors previously noticed. In *Crocuta* it is very small and slender, with a similar origin and insertion.

In the Genet, Civet, and *Crocuta* there are but three *lumbricales*, which take origin from the surface of the conjoined deep flexor tendons.

Dr. Watson and Mr. Young remark[4] of the *Hyæninæ* :—"The enormous development of the muscles of the neck and fore quarters, together with minor points already referred to, serve at once to associate" *Crocuta* with the other Hyænas, and to separate them "from the remaining groups of the Æluroidea." Doubtless also, as these authors remark, the external form and skeleton of *Proteles* indicate that its muscular system does not differ materially from that common to *Hyæna* and *Crocuta*.

SPLANCHNOLOGY.

Tongue.

The tongue in the *Felidæ* is provided with *circumvallate papillæ* disposed in two rows converging posteriorly, there being sometimes as many as six in each row. Behind these is a group of very large, soft, and pointed *flattened papillæ*. *Fungiform papillæ* are little conspicuous, but are scattered over the organ, especially at the sides of the anterior part. The *conical papillæ* have, at the anterior fourth of the dorsal surface, that well-known hard and horny character which gives a rasp-like character to the tongue of even small Cats, while in the large species these papillæ are like claws and are veritable spines.

Comparing the tongue of the Civet[5] with that of a feline animal[6], we find the tongue of the former to be relatively longer, more slender, and more pointed anteriorly. The frænum is attached for nearly two thirds the tongue's length instead of only for about half. The *lytta* is about as much developed, relatively, as in the Cat. The *fungiform papillæ* are scattered pretty equally over the greater part of the dorsum of the tongue, but are absent from a narrow elongated tract in the middle of its dorsum. There are only three *circumvallate papillæ*, one in the middle, and one on each side of it, a very little in advance, so that they form together an extremely obtuse angle open forwards.

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[1] See Cuvier's 'Planches,' pl. 128. fig. 4 γ.

[2] P. Z. S. 1879, p. 104.

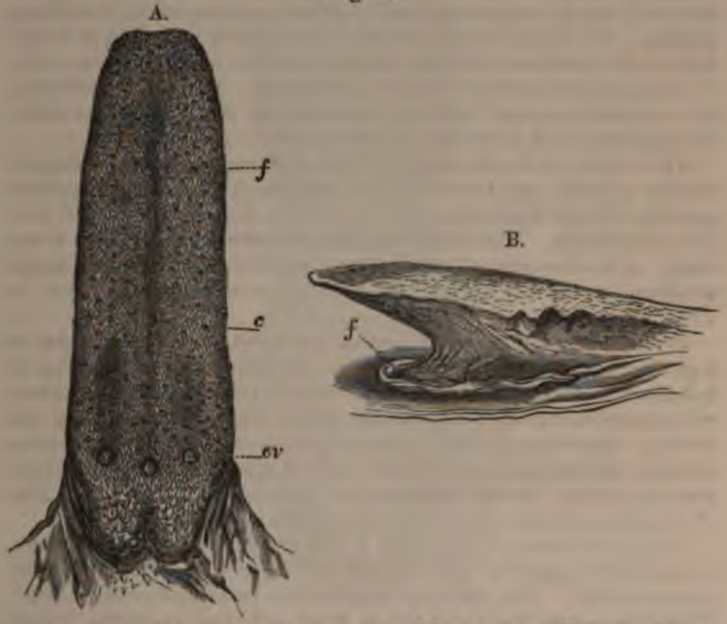
[3] 'The Cat,' p. 161.

[4] P. Z. S. 1879, p. 106.

[5] *E. g.*, the specimen No. 1513 D, Coll. of Surgeons.

[6] *E. g.*, that of the Caracal, No. 1513 C, Coll. of Surgeons.

Fig. 3.



A. Tongue of the Civet: *c*, conical papillæ; *f*, fungiform papillæ; *c.v*, circumvallate papillæ.
B. Tongue of the Genet: *f*, free fold of mucous membrane.

Each circumvallate papilla is large, with from 9 to 12 small papillæ on its surface. The *conical papillæ* are not horny [1], but are simply short conical processes scattered over the dorsum of the tongue, being longest on its middle towards the apex and also at its sides. There is no conspicuous patch of specially modified papillæ towards the anterior part of the dorsum. The *flattened papillæ* are very small, close-set, and inconspicuous compared with those of *Felis*; they are scarcely larger than the conical papillæ.

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[1] They are said by Daubenton (Buffon, Hist. Nat. tome ix. pp. 322 & 337) to be much more conspicuous in the Zibet than in the Civet.

In the Genet the flattened papillæ are larger, relatively, than in the Civet. There is no median circumvallate papilla, but either one elongate one, or two small ones on either side. There is no patch of enlarged papillæ on the dorsum, but those on the anterior half of the part in front of the circumvallate papillæ are generally larger. A large free fold of mucous membrane projects horizontally from the anterior part of the frænum on either side of it.

In *Hemigalea* there is a marked free fold of membrane, similar to that of *Genetta*. There are three circumvallate papillæ, one of which is median in position, and they form together an angle open forwards, not quite so obtuse as in the Civet. The flattened papillæ are small and inconspicuous, and there are no conspicuous fungiform papillæ. On the other hand, the conical papillæ are specially modified on the anterior half of the tongue so as to form an oblong patch of enlarged, but smooth papillæ at that part. This patch, however, is by no means so well defined a patch as that which exists in certain other genera, e. g. *Galidia*, *Herpestes*, and *Crossarchus*.

The tongue of *Nandinia* is like that of *Viverra civetta*, except it is more pointed and has a relatively stouter *lytta*. The *fungiform papillæ*, though scattered generally over its dorsum, are smaller and less conspicuous. There are only two *circumvallate papillæ*, there being no median one. The *flattened papillæ* are larger and more conspicuous, but not so large as (though more close set than) in *Felis*.

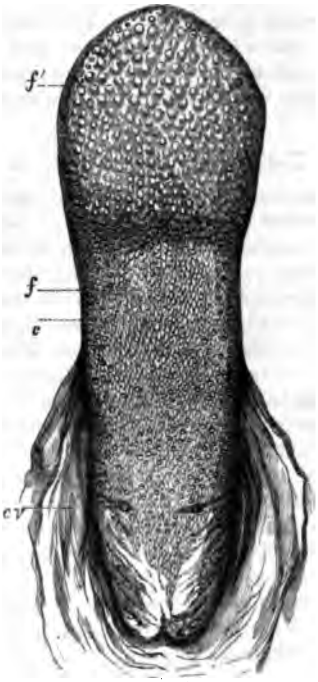
Arctictis has a tongue like that of the Civet, except that there is a greater difference of aspect between the anterior and the posterior halves of its dorsum. On its anterior half the conical papillæ are more conspicuous; and on its posterior half the fungiform papillæ are less so. Speaking generally, the fungiform papillæ are conspicuous and the conical papillæ are small. There are seven or eight *circumvallate papillæ*, which together form an angle of about 75°. The *flattened papillæ* are hardly so conspicuous as in *Nandinia*.

In the specimen of *Herpestes* I examined there were only three *circumvallate papillæ*, and they were placed almost in a straight transverse line. The *flattened papillæ* were small and inconspicuous. There was a very distinct patch of much enlarged so-called *conical papillæ* on the dorsum of the tongue, each of these papillæ being really flattened and having the appearance of having had its apex cut off. Fungiform papillæ were conspicuous, and scattered over the dorsum between the patch of enlarged papillæ and the circumvallate ones.

In *Cynictis* I found three very conspicuous *circumvallate papillæ*, which together form a right angle. Behind these are elongated *flattened papillæ*, but hardly so conspicuous as in *Nandinia*. There is, on the anterior half of the dorsum, a wide, rounded patch of much enlarged *conical papillæ*, which are really flattened in form, and so disposed as to cause the patch to have the appearance of being marked with a series of lines of the shape called "embattled" in heraldry. Around this patch, and on the middle of the tongue behind it, the papillæ are very small, and amongst them certain *fungiform papillæ* are moderately conspicuous. Conical papillæ of intermediate size are placed at the sides of the hinder half of the tongue.

In *Crossarchus*[1] we have similar characters carried to a more exaggerated degree, the *conical papillæ* of the dorsal patch being larger and the *fungiform papillæ* being more conspicuous. The three *circumvallate papillæ* form an angle of about 105°. The flattened papillæ are very little conspicuous. *Galidia* has a tongue like that of *Crossarchus*, except that the papillæ of the dorsal patch are still more enlarged.

Fig. 4.



Tongue of *Proteles*.

c, conical papillæ; *f*, fungiform papillæ; *f'*, points towards the much enlarged papillæ; *c.v*, one of the two depressions in which lie the two circumvallate papillæ.

Hyæna has for the most part a tongue like that of *Cynictis* and *Galidia* magnified; but the *flattened papillæ* are much larger relatively as well as absolutely, and are much more conspicuous.

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[1] Cuvier says (Leçons d'Anat. Comp. 2nd edit. vol. iv. 1^{e} partie, p. 553) that he did not find a lytta in the Mangoustes.

The papillæ generally, other than those of the dorsal patch, are relatively small, and the *fungiform papillæ* are but little conspicuous. Even those of the patch are relatively smaller than in the previously noticed genera. The lytta is small. There are only two *circumvallate papillæ*, and they are very small.

In *Proteles* the tongue is very exceptional indeed. It is spatulate in form, and the dorsal patch attains here its maximum of distinctness. The patch extends quite to the apex and side of the anterior third of the dorsum of the tongue. Each papilla of the patch is an enlarged hemispherical prominence. The *fungiform papillæ* are only conspicuous at the sides of the tongue and in front of the *circumvallate papillæ*, of which there are but two, each of which is situated in a very deep depression. The flattened papillæ are very inconspicuous.

The Palate, Nose, and Lips.

In all Æluroids the membrane covering the hard palate is raised into a greater or less number of transverse curved ridges, the number of which may vary somewhat with the length of the muzzle, though there are eight of them in both the Cat and the Genet. But while in the Cat the ridges form a series of very open curves (convex forwards), in the Genet the curves are much sharper. Moreover, while in the Cat each ridge is entire, in the Genet the four hinder ridges are more and more interrupted medianly, and each of these ridges, as it proceeds towards the middle line of the palate, bifurcates nearer and nearer to its origin, *i. e.* to the outer margin of the palate. By this system of bifurcations there tend to be produced eight incomplete and four complete transverse ridges, instead of, as in the Cat, eight complete ones.

The nose in the Æluroids is almost always medianly and vertically grooved; but this groove may be absent, as in *Rhinogale*, *Crossarchus*, and *Suricata*.

Similarly the upper lip is more or less vertically cleft or deeply grooved medianly. This groove, however, is absent in *Cynogale*, *Rhinogale*, *Crossarchus*, and *Suricata*.

Teeth.

The *Felidæ* have the smallest number of teeth except the dentally degraded form *Proteles*, which has but three molars above and two below on either side.

All Æluroids have I. $\frac{3}{3}$, C. $\frac{1}{1}$.

The premolars and molars may be

$$\text{Pm. } \frac{1+2+3+4}{1+2+3+4}, \text{ M. } \frac{1+2}{1+2} \Big\} \textit{Viverra, Genetta, Arctogale, Cynogale, \&c.}$$

$$\text{Pm. } \frac{1+2+3+4}{1+2+3+4}, \text{ M. } \frac{1}{1+2} \Big\} \textit{Prionodon.}$$

$$\text{Pm. } \frac{1+2+3+4}{1+2+3+4}, \text{ M. } \frac{1}{1} \Big\} \text{Some } \textit{Paradoxuri.}$$

Pm. $\frac{1+2+3+4}{2+3+4}$,	M. $\frac{1+2}{2}$	} *Hemigalidia.*
Pm. $\frac{2+3+4}{2+3+4}$,	M. $\frac{1+2}{1+2}$	} *Herpestes, Crossarchus, Suricata, Galidictis, Galidia.*
Pm. $\frac{1+2+3+4}{2+3+4}$,	M. $\frac{1}{1}$	} *Hyæna.*
Pm. $\frac{2+3+4}{2+3+4}$,	M. $\frac{1}{1}$	} *Cryptoprocta.*
Pm. $\frac{2+3+4}{3+4}$,	M. $\frac{1}{1}$	} Some kinds of *Felis.*
Pm. $\frac{3+4}{3+4}$,	M. $\frac{1}{1}$	} Other kinds of *Felis.*

The outer canine may be greatly in excess of the median ones, as in the *Hyæninæ*, or but very little so, as in the *Felidæ*. It may be of nearly the same size as a small adjacent canine, as in *Eupleres*. The canines may be greatly prolonged, as in the *Felidæ*, especially *Felis macroscelis*.

The lower canines may be excessively developed relatively, as in *Galidictis*.

The premolars may have greatly and nearly equally elongated and sharp curves, as in *Cynogale*.

The premolars and molars may be much developed antero-posteriorly into long diastemata, as in *Eupleres*; or they may be narrow antero-posteriorly, and much drawn out from within outwards, as in *Suricata*.

The teeth $\frac{\text{P. 4}}{\text{P. 4}}$ may be extremely sectorial, as in the *Felidæ*, *Cryptoprocta*, and *Hyæninæ*, or considerably so, as in most *Viverridæ*, or very slightly so, as in *Arctictis*. $\frac{\text{M. 2}}{\text{M. 2}}$ may be present and very small, as in *Nandinia*, or may be largely developed, as in *Cynogale*. The deciduous molars may be very exceptionally developed, as in *Cynogale*, where $\frac{\text{D. 4}}{\text{D. 4}}$ are relatively enormous.

The Salivary Glands.

These, in such forms as I have examined, seem to be formed on one type. In *Genetta* and *Herpestes* (and probably in all the genera) there is a distinct zygomatic gland. There is a well-developed *parotid gland* with its Steno's duct, and a small *submaxillary gland* (over which the jugular vein passes), to which small accessory submaxillary glands may be annexed.

Cuvier says[1]:—"Les Mangoustes ont des parotides minces; des maxillaires plus épaisses, nudes; de petites sublinguales allongées, en avant des maxillaires; des buccales à l'angle des lèvres; et des labiales à la lèvre inférieure." Meckel says[1] that in the Ichneumon the parotid and submaxillary glands are about equal in volume.

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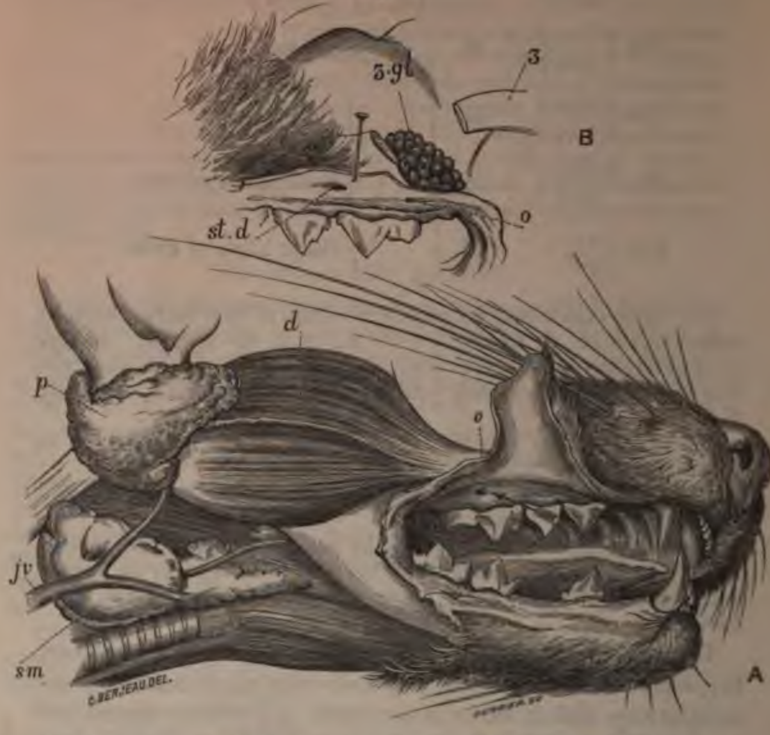
[1] Leçons d'Anat. Comp. 2nd edit. vol. iv. 1re partie, p. 425.

Fig. 5.



A. Salivary glands of Genet. *p*, parotid gland; *d*, Steno's duct; *s m*, submaxillary gland, traversed by *j v*, jugular vein; *o*, opening of Steno's duct.

B. Part of the skull of the Genet, showing the zygomatic gland, the lip being drawn up to show:—*st. d*, orifice of Steno's duct; *z. gl*, zygomatic gland; *o*, orifice of zygomatic gland; *z*, zygoma.

The Stomach.

In *Genetta tigrina* the stomach is much longer in proportion to its breadth than in the Cat[2]. Its length, measured along its middle, is about 8″·8. Its breadth at its broadest part, *i. e.* at the entrance of the œsophagus, is 2″·75. About 1″ of œsophagus extends behind the diaphragm. Inside the stomach were elongated and very prominent ineffaceable folds, placed towards the pyloric end and along the greater curvature; and there were three shorter and less strongly marked folds along the lesser curvature. All these folds come to an end simultaneously at a point where the stomach, contracting its diameter, makes a sudden bend. Beyond this point three fresh lon-

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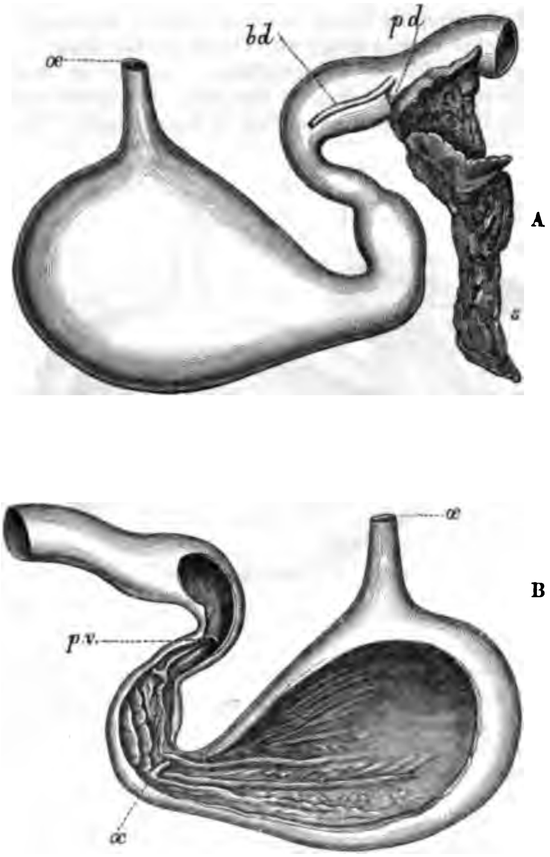
[1] Anat. Comp. vol. viii. p. 681.

[2] The dimensions of the stomach have been taken in as natural a condition as possible, the stomach not being inflated or greatly distended. Cuvier says (Leçons d'Anat. Comp. vol. iv. 1^{re} partie, p. 38) the cardia is more approximated to the pylorus than in the Cat. Meckel says (Anat. Comp. vol. viii. pp. 694, 695) that in the Puma the stomach is much more elongated and less spheroidal than in the Cat, the Leopard being intermediate in these respects.

Fig. 6.



A. Stomach and pancreas of *Genetta tigrina.* *œ*, œsophagus; *s*, pancreas; *bd*, duct from the liver; *pd*, pancreatic duct.

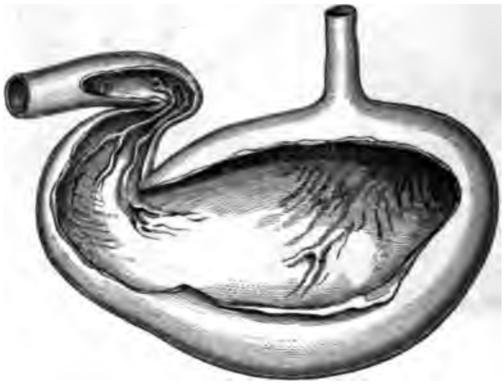
B. Stomach of Genet, cut open, showing internal folds. *x*, point where the folds are interrupted and the stomach makes a sudden bend; *pv*, pyloric valve.

gitudinal folds appear, which extend along the rest of the greater curvature. The pyloric valve was very little marked.

In *Hemigalea* I found the stomach to be very like that of the Genet, with quite similar internal folds. That of *Viverra civetta* is relatively shorter and more uniformly capacious than that of the Genet; and the pylorus exhibits a small prolongation, extending as a cul-de-sac beside the duodenum.

The stomach of *Arctictis* exaggerates the characters of the stomach of *Genetta*, its lesser curvature being extremely curved. Ineffaceable folds extend along the inside of the lesser curvature, from the pyloric side of the œsophagal opening on towards the pylorus. There are none such in *Genetta*. There are also strong ineffaceable folds in the pyloric portion of the stomach. The pylorus continues on into a sort of cul-de-sac, which extends for a little beside the beginning of the duodenum. The bile-ducts enter full 4″ from the pylorus.

Fig. 7.



Stomach of *Prionodon*, cut open.

In *Prionodon* I found the stomach to be shorter and more globular than that of the Genet, and of remarkably large size in proportion to the size of the body.

In *Herpestes* I found the stomach long, and very much constricted towards its middle. This constriction does not appear in two dried specimens of stomach of *Herpestes* in the Museum of the College of Surgeons. *Herpestes*, however, is a very large and varied genus[1].

In *Crossarchus* the stomach is short and globular, but the cardia is considerably prolonged.

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[1] Hunter says (' Essays and Observations,' vol. ii. p. 66) of the Ichneumon:—"The stomach is almost a round cavity, the small end as thick and short as the large."

In *Suricata* the stomach is very short and round, while the cardia is extremely short[1].

Cynictis has a stomach more like that of the Genet, but not quite so elongated. There are folds inside the middle part of the greater curvature, but not towards the pylorus, which has a cul-de-sac extending beside the beginning of the duodenum. The cardia is very elongated.

The stomach of *Galidia* is very like that of *Crossarchus*. Its cardia is of considerable size, and elongated. In *Proteles* it is short and much bent, and shows a tendency to the formation of a pyloric cul-de-sac. There is a large cardia; but it is not prolonged as in *Cynictis*, *Crossarchus*, and *Galidia*. There are considerable internal folds, as described by Professor Flower[2], who remarks:—"The whole organ closely resembles that of the Armadillos, which the *Proteles* resembles in the nature of its food, though so widely removed in zoological position." The Hyæna has a rather rounded stomach, more or less resembling that of *Proteles*. Professor Flower says[3]:—"The stomach is less elongated than in *Felis*, its fundus being very little developed."

The Intestine and Cæcum.

In *Genetta tigrina* I found the length of the small and large intestines to be respectively about 120″ and 14″·25, the cæcum being 2″·75. The cæcum was obtusely pointed, with thin walls and without glands, save a minute Peyer's patch, situated on the inner side of its very apex.

As to *Felis*, Hunter found the small intestine in the Lion to be four times as long as the body, and the large intestine to be two thirds that length. In the Hyæna the small intestine is about eight times the length of the larger. In *Proteles* the intestinal canal is not five times the length of the body[4]. In *Hyæna* the large intestine is from one eighth to one sixth the length of the small intestine. In *Crocuta*[5] it is less than one twelfth.

Amongst the dried preparations in the Museum of the College of Surgeons I find parts of the intestine of a Lion and a Tiger, in both of which there is a rather long, simple cæcum, which is in both (but especially so in the Lion) relatively longer than in the cæcum of *Felis catus*. Hunter found the cæcum to be from 2 to 3 inches long in the Lion.

In *Viverra civetta* the cæcum is relatively a little longer than in *Genetta*; but a dried specimen of *Viverra tangalunga* exhibits a short and rounded cæcum, while one of *Viverricula* is also rounded, but longer.

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[1] For figures of the Suricate's stomach and cæcum see Owen's 'Anatomy of Vertebrates,' vol. iii. pp. 444, 445.

[2] P. Z. S. 1869, p. 474.

[3] 'Medical Times and Gazette,' Jan. 15, 1872, p. 679.

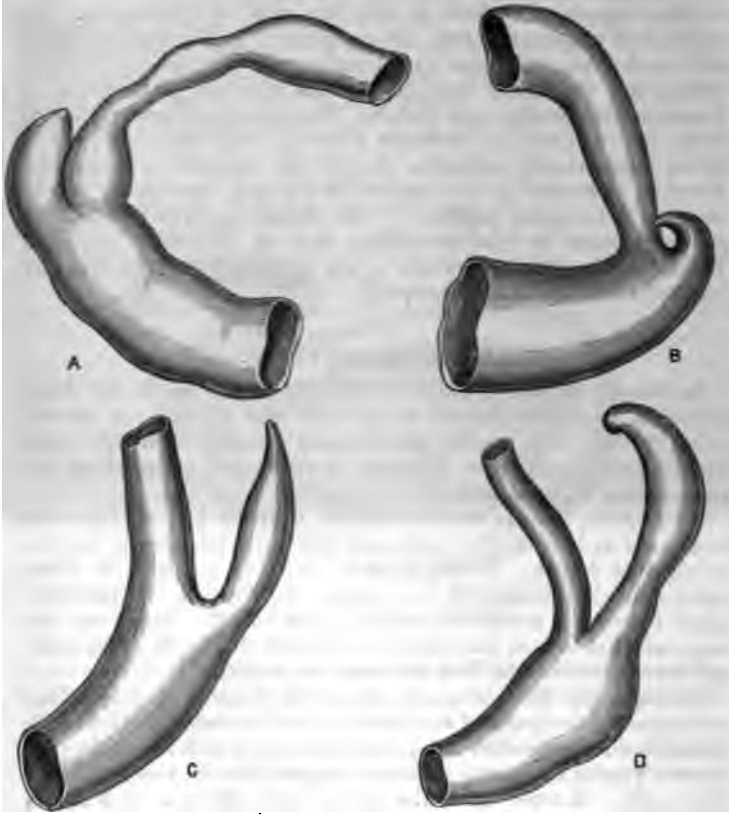
[4] Ibid.

[5] P. Z. S. 1879, p. 84.

In *Prionodon* I found the cæcum to be very small and short, but strongly curved and acutely pointed.

Hunter says ('Essays and Observations,' vol. ii. p. 66) that in the Ichneumon there is no cæcum. It is therefore perhaps occasionally

Fig. 8.



A. Cæcum of *Genetta*. B. Cæcum of *Prionodon*. C. Cæcum of *Galidia*. D. Cæcum of *Cynictis*.

absent in that large genus. In a spirit-specimen of *Herpestes*, however, I found a long, slender and pointed cæcum; while in the series of dried cæca of *Herpestes* in the College of Surgeons some cæca are rather long, while others are short. Specimens of *Paradoxurus* exhibit a similar range of variation from moderately long to short and rounded.

In *Suricata* the cæcum is short, and shaped much as in the Cat.

A large Peyer's patch extends down to the ilio-cæcal valve; and there are glands at the cæcum's apex. In a dried specimen I find the cæcum with a rounded dilatation at its end; but this is probably an artificial distortion.

In *Hemigalea* I found the cæcum to be of about the same size as in the Genet, but with strong ineffaceable internal folds, which meet at the apex around a small glandular rosette of about six glands, each gland being about the size of a pin's head.

In *Galidia* the cæcum is long, rather slender, and exceedingly pointed towards its apex. In *Cynictis* it is very long (compared with the other Æluroids), rather slender, and a little curved.

In *Arctictis* the cæcum all but or quite aborts[1]. The large and small intestines run on as one longitudinal tube, of equal calibre, independently of it, with long and strong internal longitudinal folds, which are not interrupted at the place where the minute, quite rudimentary cæcum is given off. There is no trace of a transverse constriction or valvular structure between the small and the large intestine. In *Nandinia*, on the contrary, though there is no external indication of a cæcum, or change in the gut's diameter, there is a distinct interruption in the internal structure of the alimentary tube at the junction of the small and large intestines. There is, in the first place, a transverse valvular fold. On the small-intestine side of this fold there is a large continuous Peyer's patch, while on the other side of it longitudinal ridges begin to appear. These ridges, however, are not nearly so strongly marked as they are in *Arctictis*.

In *Proteles* the cæcum is short, thick, and rounded[2].

In *Hyæna* the cæcum is long, simple, and rather pointed. It is about 8 inches long. In *Crocuta*[3] it is 6 inches long.

Cuvier[4] gives the proportion in the Hyænas of the circumference of the small intestine to its length as 1 to 110, and of the large as 1 to 6. He also says[5] that the small intestine increases in diameter from the pylorus to the cæcum, and that its walls are so thin as to be almost transparent, though those of the Carnivora are generally more or less thick.

Meckel[6] says that the proportions borne by the small intestine to the large intestine, are in the Cat from 5 to 1 to 6 to 1, in the Genet as 8 to 1, in the Civet as 10 to 1, in the Zibeth as 15 to 1, and in the Hyæna as 5 (or 7) to 1.

According to Hunter ('Essays and Observations,' vol. ii. p. 56), the small intestine in the Suricate is "something more than the whole length of the body of the animal," while the large intestine "is more than half that length."

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[1] P. Z. S. 1878, p. 142. On the other hand, the cæcum may be half an inch long: see Journal of Asiatic Soc. of Bengal, vol. xv. p. 193.

[2] P. Z. S. 1869, p. 474.

[3] P. Z. S. 1879, p. 84, fig. 2.

[4] Leçons d'Anat. Comp. vol. iv. 1e partie, p. 211.

[5] *L. c.* p. 236.

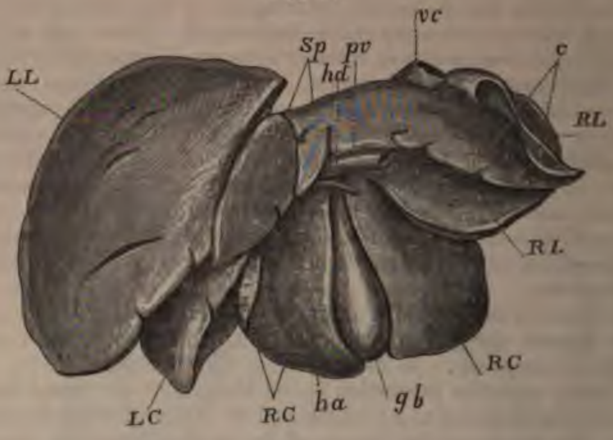
[6] Anat. Comp. vol. viii. p. 703.

The Liver.

The liver in ***Felis*** has the left lateral and right central lobes very large, the latter being divided by a deep cystic fissure, in which lies the gall-bladder, and the former being also somewhat divided by a fissure. The right lateral and left central lobes are each undivided and very small. The caudate lobe is of moderate size, about as large as the left central lobe. The Spigelian lobe is small (the smallest lobe), and is not divided by any fissure.

The liver of ***Genetta tigrina*** is very like that of the Cat; but the left lateral lobe is quite undivided, save by a small shallow groove on its posterior (gastric) surface. The cystic fissure is less deep than in the Cat, and is situated more to the right, so that the portion of the right central lobe which is to the right of the gall-bladder is much less in excess of that part of the right central lobe which is to the left of the gall-bladder. The caudate lobe has a very deep concavity, and is larger in proportion to its breadth. It runs uninterruptedly into the Spigelian lobe, which latter is a little larger relatively than in the Cat, and has a very deep groove (or fissure) running dorsad from its ventral margin, and dividing its proximal third from its distal two thirds. The diaphragmatic surface of the liver exhibits but a short cystic fissure.

Fig. 9.



Liver of *Genetta tigrina*, its posterior (gastric) surface.

c, caudal lobe; *g b*, gall-bladder; *h a*, hepatic artery; *h d*, hepatic duct; *L C*, left central lobe; *L L*, left lateral lobe; *p v*, portal vein; *R C*, right central lobe; *R L*, right lateral lobe; *Sp*, Spigelian lobe; *v c*, vena cava.

In ***Viverra civetta*** the right lateral and right central lobes appear nearly of equal size, as seen on the diaphragmatic aspect of the liver.

The right central lobe has a short and wide cystic fissure, through which the gall-bladder appears. That portion of the right central lobe which is on the right of the gall-bladder also appears to be more in excess of the portion which is on the left of the gall-bladder than it is in *Genetta tigrina*, and thus more to resemble its condition in the Cat. This appearance is caused by the circumstance that, in the Civet, the large right lateral lobe comes down and excludes from view (on the abdominal surface) all that part of the right central lobe which lies to the right of the gall-bladder. The left central lobe is quite hidden from view when the abdominal aspect of the liver is seen. The Spigelian lobe is much stouter than in the Genet, and is not grooved.

In *Paradoxurus larvatus* the liver is like that of the Genet, except that the caudate lobe has become very large at the expense of the right lateral; so that, on the diaphragmatic surface, the right lateral lobe appears as a triangle between the caudate aad the large right central lobes. There is no gall-bladder; nevertheless the right central lobe is notched as in the Genet. The left lateral and left central lobes present, on their diaphragmatic surface, an appearance similar to that which they present in *Genetta*. The posterior (gastric) aspect of the liver is also much as in the Genet, save that the caudate lobe is very large and the Spigelian lobe smaller, not grooved and slightly bifurcated at its apex.

In *Nandinia* the diaphragmatic aspect of the liver is much as in *Viverra*, but the right lateral lobe is smaller in proportion to the right central, though not so much smaller in relation to it as in *Genetta*. The right central is deeply notched at its ventral margin, but does not show any gall-bladder. The left central lobe is rather smaller in proportion to the left lateral than in *Viverra*, and is larger in proportion to its breadth. The left lateral lobe is nearly bisected by a transverse fissure which runs inwards from its lateral margin. The abdominal (gastric) aspect of the liver shows a caudate and a Spigelian lobe nearly as in *Genetta*. The left central is quite excluded from view. That part of the right central lobe which is on the right of the gall-bladder is more in excess of the part on the left, and is much as it is in the Cat.

In *Arctictis*, on the diaphragmatic aspect of the liver, the right and left segments appear nearly equal; the right lateral and right central lobes are also nearly equal. The latter has two ventral notches, the one more to the right being the cystic notch. No gall-bladder, however, appears. The proportions of the left lateral and left central lobes are much as in *Nandinia*; but the apex of the left central is separated off by an oblique transverse groove.

The posterior aspect of the liver is very like that of the liver of *Nandinia*; but there is no transverse groove on the left lateral lobe. That portion of the right central lobe which is on the right of the cystic notch is smaller than the portion which is on the left of that notch. The latter portion has four or five superficial fissures. In this condition of excess in the left portion of the right central lobe *Arctictis* differs from *Felis*, *Genetta*, *Viverra*, *Paradoxurus*, and *Nandinia*.

The liver of *Prionodon* differs remarkably from that of every other form I have examined in the much smaller relative size of the left central lobe compared with that of the left lateral; so that the latter rises (the apex of the gall-bladder being downwards) above the former, and forms nearly half of the posterior surface of the liver's left segment. These two lobes (the left lateral and the left central) are not separated, but are continuous towards their inferior margins. It is as if the left segment of the liver consisted only of one great lobe, the right portion of which was bent over so as to end in a free margin, to the right (on the abdominal surface) of the great bulk of such one lobe.

The gall-bladder lies in a fossa, placed very much towards the left margin of the right central lobe. The proportion borne by the right lateral lobe to the right central seems to be much as in the Genet[1]. The Spigelian lobe is small and simple; the caudate lobe is moderate. On the diaphragmatic aspect of the liver, the small left central lobe only shows a little towards the ventral margin. There is a deep cystic notch.

The liver of *Hemigalea* is almost like that of *Genetta*; but its Spigelian lobe has no notch, its caudate lobe is smaller, and its right lateral lobe is rather large compared with its right central. There is a gall-bladder, which is placed in nearly the same position in the right central lobe as it is in *Genetta*. This liver also resembles that of *Genetta* as to its diaphragmatic aspect, save that its right lateral lobe is rather larger and more pointed.

In *Herpestes* the liver is very much like that of *Genetta*, save that in it the right lateral lobe is smaller compared with its right central lobe, and that its gall-bladder lies much more close to the left margin of the right central lobe.

In *Crossarchus* the preponderance of the right segment of the liver over its left segment is greater than in any other form yet described; it is nearly as two to one. The diaphragmatic aspect of the liver presents the following characters:—The right lateral lobe is very small compared with the right central; this proportion is much as in *Paradoxurus*; but the shape is very different, broadening instead of narrowing to its outer margin. The right lateral lobe is not broad enough to hide the very large caudate lobe. The right central lobe has a notch, not at its ventral margin, but at its left end: it is a short side notch, wherein the gall-bladder appears. The proportion of the left lateral lobe to the left central is much as in *Nandinia*; but they are not quite so unequal.

On the abdominal aspect, the very large caudate lobe (larger relatively than in any form yet here noticed) is seen with a small, simple Spigelian lobe. The left central lobe does not appear. The left lateral lobe is entire, but hidden by the caudate lobe. The right central lobe is very large; but the excess of that part of it which is on the right of the gall-bladder over the minute portion on the left of the gall-bladder is greater than in any other form yet here described. Thus the bladder makes its appearance between the right part of the right central lobe and the left lateral lobe, both the right lateral and the left face of the right central lobe being hidden.

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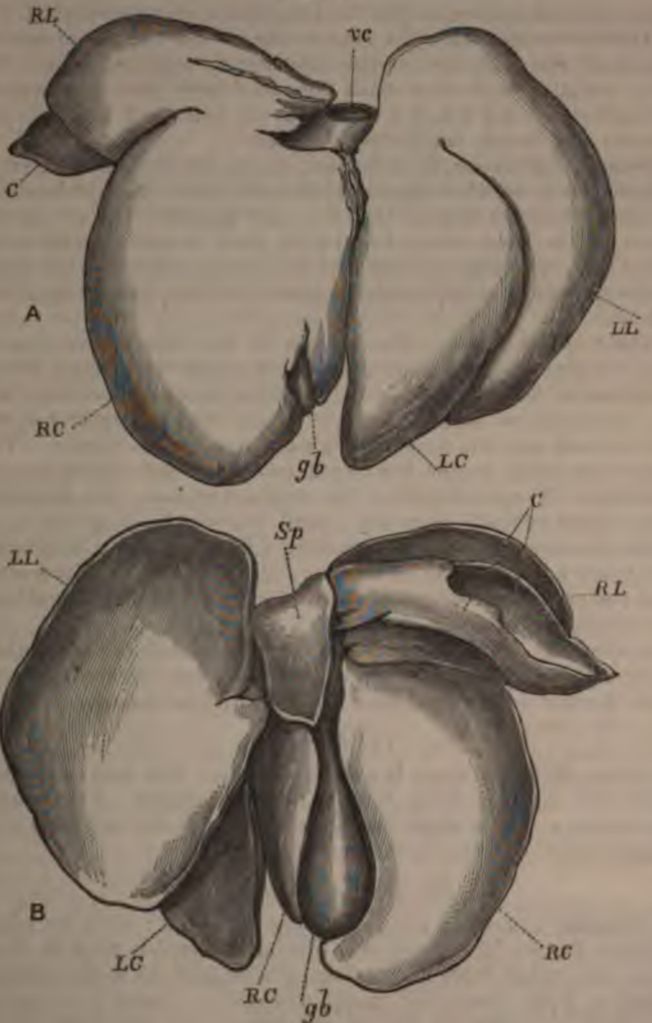
[1] The liver of the specimen examined was injured in this region.

Fig. 10.



Liver of *Herpestes* (letters as in fig. 9).
A, anterior (diaphragmatic) aspect; B, posterior (gastric) aspect.

The liver of ***Galidia*** is formed on the same type as that of ***Crossarchus*** as regards the small size of the right lateral lobe compared with the right central, and in the proportion of the left lateral to the left central lobe, in the cystic notch and gall-bladder being quite close to the left margin of the right central lobe, in the proportion borne to the left lateral lobe by the left central, and in the great size and in the close approximation (on the abdominal surface of the liver) of the left lateral and right central lobes. On the diaphragmatic aspect of the liver the caudate lobe hardly appears, though the right lateral lobe is very small compared with the right central. The last-mentioned lobe has a notch at the bottom of the umbilical fissure; and therein lies the gall-bladder.

Seen on its posterior, or abdominal, aspect, the liver shows a small Spigelian lobe, which is slightly bifid at its apex. The caudate lobe is small. The left central lobe does not appear. The proportion borne by the right lateral lobe to the right central is much as in *Nandinia*. The right central lobe lies almost entirely to the right of the gall-bladder, only a minute portion of that lobe being to the left of it.

The liver of *Proteles* also belongs to the *Crossarchus* type of liver, in that the gall-bladder lies close to the left margin of the right central lobe—the cystic and umbilical fissures coinciding. On its diaphragmatic aspect the right lateral lobe is larger than the right central, and the former has a small notch at its margin. The proportion borne by the left lateral lobe to the left central is as in *Nandinia*. The small caudate lobe does not appear. On the abdominal aspect of the liver we see a small and simple Spigelian and a similar caudate lobe. The right lateral lobe is notched at its border, and bears a lobelet near its margin. No part of the right central lobe lies on the left side of the gall-bladder. The left lateral lobe has a puckered surface.

In *Crocuta*[1] the gall-bladder also lies much nearer to the left than to the right margin of the right central lobe; but the umbilical and cystic fissures do not coincide. The caudate lobe is large.

The Kidney.

In the Æluroids there is a single papilla. This is at least certainly the case in *Felis, Genetta,* and *Prionodon*. In *Genetta tigrina* the kidney is large, and more oval than in the Cat. Its long diameter is 3″ 4‴; its transverse diameter is 2″.

The Trachea and Lungs.

There are 45 cartilages to the trachea in the Cat; 40 in the Lion; 47 in the Puma; 70 in the Genet; 50 almost complete rings in *Suricata,* and rather more in the Ichneumons: and 45 in the Hyæna (Meckel, Anat. Comp. vol. ix. pp. 484–487). Cuvier (*l. c.* vol. vii. pp. 52 & 102) remarks that in the Ichneumon the rings of the trachea extend four fifths round it, and that those of the bronchi disappear soon after they have entered the lungs. Meckel (*l. c.* p. 490) says that in *Viverra* the bronchi are large and with complete rings, and that these are very hard and complete and the bronchi long and narrow in *Hyæna*; while in *Suricata* the bronchi are very large, and almost without rings.

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[1] P. Z. S. 1879, p. 85, fig. 3.

In *Felis, Viverra, Genetta, Hemigalea, Herpestes, Suricata, Proteles*, and *Hyæna* the lungs are divided into four lobes on the right side, and into three on the left side.

In *Crocuta*[1] the right lung has six lobes and the left lung three. Meckel (*l. c.* p. 492) says that the two lower left lobes in the Genet form but one, and that in the Tiger, Leopard, and Puma there are also but two on the left.

Great Blood-vessels.

In *Felis, Viverra, Genetta, Hemigalea, Proteles*, and *Crocuta* the aortic arch gives off one great trunk, whence arise first the right subclavian and then the carotids. The left subclavian is given off separately[2].

In *Felis, Genetta, Prionodon, Hemigalea, Herpestes*, and *Crocuta*[3] the abdominal aorta does not give off common iliac arteries, but first gives off two large arteries which spring opposite each other from the aorta and are the *external iliac arteries*, and then continues on for a short space before giving off another pair of vessels (also arising opposite each other), which are the *internal iliac arteries.*

THE BRAIN.

In the brain of the Cat, and in the brains of such *Felidæ* as I have had the opportunity of seeing, there is a well-marked crucial sulcus, the hinder inner end of which is separated (on the inner surface of each cerebral hemisphere) from the anterior end of the calloso-marginal sulcus by the continuation forwards of the hippocampal gyrus into the superior external gyrus. This condition does not seem to obtain in any non-feline Æluroid.

In *Genetta* the superior lateral gyrus (*s*) runs simply forwards beside its fellow of the opposite side without being divided by any transversely extending crucial sulcus, the place of which is only indicated by a minute notch on its inner border (*c n*). Nevertheless the superior lateral gyrus bears a small depression (*d*) placed a little behind and external to the notch just mentioned; and this depression may represent the outer end of the crucial sulcus of *Felis*.

At its anterior end the superior lateral gyrus dips down, and then becomes in part continuous with the middle lateral gyrus (*m*) above the upper end of the supraorbital sulcus (*o s*).

The Sylvian fissure (*S f*), which is rather long and strongly concave forwards, is bounded on each side by the inferior lateral gyrus, which gyrus is much broader behind than in front of the Sylvian fissure. The inner side of the anterior end of the superior lateral gyrus (beyond the notch *c n*) runs backwards, beneath the callosomarginal sulcus, and becomes continuous with the hippocampal gyrus.

From the minute indication of the crucial sulcus (*c n*) a sulcus runs backwards, which may be considered as representing the crucial sulcus and the calloso-marginal sulcus united.

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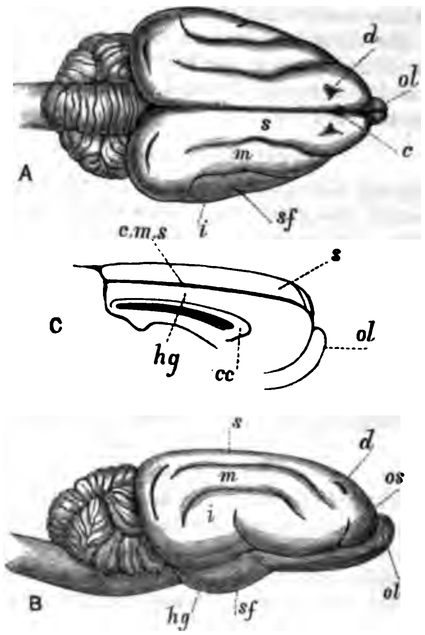
[1] P. Z. S. 1879, p. 88, fig. 4.

[2] Meckel (Anat. Comp. vol. ix. p. 396) appears to have found all four vessels spring from a common trunk in the Genet.

[3] P. Z. S. 1878, p. 89.

Fig. 11.



Brain of *Genetta tigrina*, natural size.

A, dorsal surface. B, lateral external surface. C, median or inner surface of right hemisphere.

c c, corpus callosum; *cm s*, calloso-marginal sulcus; *c*, notch representing crucial sulcus; *d*, depression on superior lateral gyrus; *h g*, hippocampal gyrus; *i*, inferior lateral gyrus; *m*, middle lateral gyrus; *ol*, olfactory lobe; *o s*, supraorbital sulcus; *s*, superior lateral gyrus; *S f*, Sylvian fissure.

In *Viverra civetta* the crucial sulcus is slightly more marked, and the supraorbital sulcus rises higher, than in the Genet. The calloso-marginal sulcus runs forward and joins the rudimentary crucial sulcus. That part of the inferior lateral gyrus which lies in front of the Sylvian fissure is as large as, or larger than, the part behind the Sylvian fissure, and may be subdivided by a sulcus.

In *Paradoxurus* that part of the inferior lateral gyrus which is behind the Sylvian fissure is wide, and bears a V-shaped sulcus. There is hardly even a rudiment of the crucial sulcus.

In *Nandinia* the brain is as in *Genetta*, save as regards that part of the inferior lateral gyrus in front of the Sylvian fissure, which part is as in *Civetta*.

In *Arctictis* that part of the inferior lateral gyrus which is behind the Sylvian fissure is wide, and bears a V-shaped sulcus; and the superior lateral gyrus has additional depressions. The crucial sulcus is distinct, but small; and the calloso-marginal sulcus joins it and goes on forwards beyond it. The sulcus between the superior lateral gyrus and the middle lateral gyrus extends so as almost to join the supraorbital sulcus.

In *Proteles* the crucial sulcus is well developed, much as in the Cats; and the same is the case in *Hyæna* and *Crocuta*[1], which have additional sulci on the inside of the superior lateral gyrus, and generally on that part of the inferior lateral gyrus which is posterior to the Sylvian fissure. The large forms of *Herpestes* show a tendency to the same development; and in *Herpestes* and *Crossarchus* there is a small crucial sulcus.

THE EYE.

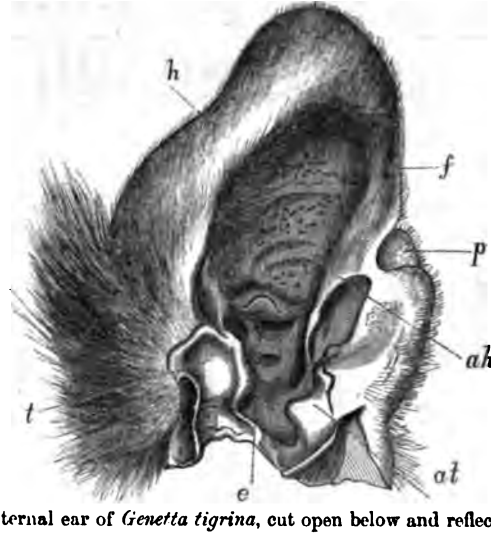
The tapetum in *Genetta tigrina* and in *Hemigalea* closely resembles that of *Felis catus*.

The pupil may contract so as to leave a vertical slit, as in most Cats and in *Paradoxurus*; or an oblong erect aperture, as in *Felis chaus*; or a horizontally extended aperture, as in, at least some, *Herpestes* and *Bdeogale*; or in a circular aperture, as in the Lion and larger Cats.

THE EAR.

The external ear in *Genetta tigrina* has a reduplication, forming a pouch at the lower part of the hind margin of the concha, much as in the Cat; but the pouch is not so deep.

Fig. 12.



External ear of *Genetta tigrina*, cut open below and reflected.
t, tragus; *at*, antitragus; *e*, supratragus; *p*, pouch; *h*, helix; *ah*, antihelix; *f*, fossa of helix.

There is a tragus which fits into a concavity of the double antitragus; and there is a supratragus; but the latter is not so elongate and pedunculate as in the Cat.

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[1] P. Z. S. 1879, p. 90, figs. 5 & 6.

The Auditory Ossicles.

The malleus is the only ossicle which presents readily available classificatory characters. These have been examined and described by Mr. Alban Doran[1]. From an examination of the collection of ossicles in the Royal College of Surgeons, with the use of Mr. Doran's paper, I have noted the following characters in the following groups:—

	Felidæ.	*Viverrinæ.*	*Herpestinæ.*	*Cryptoproctinæ.*	*Hyænidæ.*
(1) ...	Head moderate.	Head moderate.	Head very large.	Head moderate.	Head large.
(2) ...	Lamina large.	Lamina large.	Lamina rudimentary.	Lamina large.	
(3) ...	Neck long.	Neck long.	Neck short and stout.	Neck long.	Neck long and stout.
(4) ...	Manubrium slender and straight.	Manubrium slender and straight.	Manubrium broad and curved.	Manubrium very slender.	Manubrium thick and curved.
(5) ...	Processus brevis rather well marked and straight.	Processus brevis blunt.	Processus brevis well marked.	Processus brevis blunt.	Processus brevis well marked.
(6) ...	Processus muscularis from neck, long and sickle-shaped.	Processus muscularis small, from neck.	Processus muscularis short, stout; springs not from neck, but from manubrium.	Processus muscularis rudimentary.	Processus muscularis very short, rather lower down.
(7) ...	Articular surfaces deeply cut; the upper one flat, the lower one convex; the groove fades outwards.	Articular surfaces deeply cut; both are convex; and the groove runs into an internal concavity.	Articular processes deeply cut; both are convex; and the groove runs into an internal concavity.	Articular surfaces deeply cut; both are convex; and the groove runs into an internal concavity.	Articular surfaces may or may not have a groove running into a concavity.

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[1] Trans. Linn. Soc. new series, (Zoology) vol. i. p. 371.

SEXUAL ORGANS.

The penis presents every variety as to its internal osseous support. It is entirely boneless in the *Hyænidæ*; and the bone is rudimentary or absent in the *Viverrinæ*. It is tolerably developed in the *Herpestinæ*, and very large indeed in *Cryptoprocta*.

Cuvier says[1] of the Ichneumon:—"Le gland est comprimé sur les côtés, arqué en dessus à son extrémité, et composé, en très grande partie, de l'os qu'il contient. Son bord inférieur présent une fente qui ne s'étend pas jusqu'à l'extrémité. Elle aboutit à une sorte de cul-de-sac très profond, qui remplit l'échancrure de l'os, et au fond duquel viennent s'ouvrir, par deux orifices séparés, l'urètre et le canal excréteur commun des glandes de Cowper."

Crocuta differs from all other Æluroids in that the clitoris is enormous and traversed by the urogenital canal[2].

In *Arctictis* the Cowper's glands are each less than half the size of the bilobed prostate. In *Prionodon*, on the contrary, each Cowper's gland is about as large as is the whole of the bilobed prostate.

According to Professor Owen (Anat. of Vertebrates, vol. iii. p. 780), Felines have usually six nipples, four ventral and two pectoral; but there are eight in the Domestic Cat. There are four ventral teats in *Paradoxurus*, *Herpestes*, and *Hyæna*; but in *Viverra* there may be two pectoral teats also.

SCENT-GLANDS.

Of these glands there are two very distinct categories. One category comprises the prescrotal scent-glands, and the other the anal glands.

The Prescrotal Glands[3].

These are met with in their most complete form in *Viverra civetta*, where there is a pair of medianly adjoined glands placed between the penis and the scrotum in the male, and in an analogous position in the female. Their secretion escapes into a large scent-pouch, the external aperture of which appears as an antero-posteriorly extended slit simulating a large vaginal aperture. This aperture is larger than either the vulva or the anus. Each scent-gland is about twice the size of one of the animal's anal glands; and in each scent-gland is a central cavity which communicates with the median scent-pouch, into which the glands also open by a number of minute orifices.

In *Viverra zibetha*[4] the scrotum is similar. In *Arctictis* the secretion of the prescrotal gland exudes into a naked cutaneous invagination placed, like a vulva, in front of the anus. A similar invagination exists in *Paradoxurus*, and a naked space in *Nandinia*.

In *Genetta* and *Hemigalea* the conditions are those already described and figured by me[5]. The scent-glands contain numerous small cavities which rather increase in size towards the surface of each gland.

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[1] Leçons d'Anat. Comp. vol. viii. p. 222.

[2] P. Z. S. 1877, p. 369, fig. 41.

[3] Chatin, Ann. des Sci. Nat. (5th series) vol. xix. (1874).

[4] There is an old but an excellent preparation of these glands in the Museum of the Royal College of Surgeons, Physiological Series, No. 2514.

[5] P. Z. S. 1882, p. 156.

Anal Glands.

There are constantly two anal glands, one on each side of the anus, in all Æluroids. The glandular structure may be a transverse band of follicles extending between the two anal glands, as in (at least some) *Herpestes*, *Crocuta*, and *Proteles*. The anal glands may be augmented to three pairs, as in *Hyæna brunnea* [1], or even to five pairs, as in *Crossarchus*. These glands, together with the anus, may open into a deep anal pouch, as in the *Hyænidæ*, *Crossarchus*, *Suricata*, and *Cryptoprocta*; or the anus may open on the surface of the body, as in the *Felidæ* and almost all, if not all, the *Viverrinæ*.

2. On some *Laridæ* from the Coasts of Peru and Chili, collected by Capt. Albert H. Markham, R.N., with Remarks on the Geographical Distribution of the Group in the Pacific. By Howard Saunders, F.L.S., F.Z.S.

[Received May 16, 1882.]

(Plate XXXIV.)

Capt. A. H. Markham, already well known for his circumpolar explorations, has availed himself of the opportunities afforded by his appointment to the command of H.M.S. 'Triumph,' on the South-Pacific station, and has sent home from there an interesting collection of birds. The specimens belonging to the *Procellariidæ* have been placed in the hands of Mr. Osbert Salvin, who has made that family his special study; and the present paper is limited to the *Laridæ*, of which the collection contains examples referable to 15 species. Amongst these is a specimen of that rarest of Gulls, and one of the rarest of all birds, *Xema furcatum* (the large forked-tailed congener of the circumpolar *Xema sabinii*), a species of which only two examples were previously known, and the rediscovery of which, after forty years' fruitless search, is due to the energy of Captain Markham.

The following *Laridæ* were obtained between Payta, in 5° 11′, and Coquimbo, in 30° S. lat. In addition to the original name of each genus and species, only those references are given which bear upon geographical distribution in the Neotropical Region.

Nænia inca (Lesson).

Sterna inca, Lesson, Voy. 'Coquille,' ii. p. 731, Atlas, pl. 47 (1826).

Nænia inca, Boie, Isis, 1849, p. 189; Scl. & Salv. P. Z. S. 1871, p. 567; Saunders, *op. cit.* 1876, p. 667.

[No. 28 (♂ adult), no. 29 (♂ immature), Callao Bay, August 1881.]

In the latter the general hue of the upper parts is of a smoke-grey, much lighter than in the adult, and the moustache-like plumes beneath the eye merely show traces of the white colour which is subsequently assumed. The breeding-haunts of this bird are still unknown; they are surmised to be on the island of San Lorenzo, in Callao Bay, and in similar situations along the coast, but nothing has yet been positively ascertained.

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[1] Trans. Zool. Soc. vol. vii. p. 506.

STERNA MAXIMA, Bodd.

Sterna maxima, Bodd. Tab. Pl. Enl. p. 58, no. 988 (1783); Scl. & Salv. P. Z. S. 1871, p. 567; Saund. *op. cit.* 1876, p. 655.

[No. 78 (♂), no. 79 (♀), Payta, January 1882. Eyes black.]

Nearly adult, but the secondaries still show some of the dark markings indicative of immaturity, and only the crown and nape are as yet streaked with black; the bill is orange-yellow. In the adult, in breeding-plumage, the entire crown from the base of the bill is deep glossy black—a characteristic which distinguishes it from *Sterna bergii* of the African and Indian seas, in which a broad fillet of white intervenes between the black forehead and the base of the bill. These two species were long confounded; and as *S. maxima*, which is properly an American species, reaches across to the west coast of Africa, and even as far north as the Straits of Gibraltar, it may not be superfluous to point out this distinction. *S. maxima* has also a lighter mantle than *S. bergii*; but impinging upon the range of the latter comes a large light-mantled Tern, *S. bernsteini*, found between the island of Rodriguez and the island of Halmahera. This last very rare species, in its winter plumage, much resembles *S. maxima*; the breeding-plumage is as yet unknown, so that it is at present impossible to say if the black crown extends to the base of the bill or is terminated by a white band.

STERNA ELEGANS, Gamb.

Sterna elegans, Gamb. Pr. Phil. Ac. iv. p. 129 (1848); Saund. P. Z. S. 1876, p. 653.

[No. 32, Callao Bay, Sept. 1881; nos. 33 & 34, Coquimbo Bay, Nov. 1881. Eyes dark brown.]

Adult, but not old, birds, in winter plumage, in which only the nape and crown are black. The Callao example is slightly smaller than the two others; but this is the only difference.

It was with diffidence that I separated its Atlantic representative from this species, under the name of *S. eurygnatha* (P. Z. S. 1876, p. 654); but the subsequent examination of a more extensive series has hitherto confirmed the views then entertained as regards their specific distinctness, mainly based upon the relative position of the mandibular angle.

The breeding-resorts of *S. elegans* are as yet unrecorded, nor have I hitherto succeeded in examining an adult in nuptial dress. It is known to frequent the coast as far north as California, and will probably be found breeding along the Pacific shores of Mexico; nevertheless Mr. Forrer, who found *S. maxima* abundant in Lower California, did not obtain *S. elegans*.

STERNA HIRUNDINACEA, Less.

Sterna hirundinacea, Lesson, Tr. d'Orn. p. 621 (1831); Saund. P. Z. S. 1876, p. 647.

Sterna cassinii, Scl. P. Z. S. 1860, p. 391; Scl. & Salv. *op. cit.* 1871, p. 570.

[No. 30 (juv.), no. 31 (adult), Callao Bay, August 1881; nos. 35 & 36 (juv.), Coquimbo Bay, Nov. 1881. Eyes dark brown.]

One adult, and three birds of the year in progressive stages of winter plumage. Callao, in 12° S. lat., is a considerable advance of range over that of Coquimbo in 30° S., the furthest previously recorded (Cunningham, 'Ibis,' 1870, p. 500). The head-quarters of this southern species are on the coasts and islands of the Chilian archipelago, the Straits of Magellan, Patagonia, and the Falkland Islands; but on the Atlantic side of the continent its range northwards is not known to extend beyond Rio de Janeiro, in 23° S. lat.

STERNA EXILIS, Tsch.

Sterna exilis, Tschudi, F. Per. Aves, p. 306 (1846); Scl. & Salv. P. Z. S. 1871, p. 572; Saund. *op. cit.* 1876, p. 663.

[Nos. 37 & 38, Paracas Bay, Peru, October, 1881. Eyes brown.]

I have now examined five, and possess three specimens of this very distinct, although little-known member of the *Sternula* subdivision.

It is a purely South-Pacific species, which may be briefly described as a long-winged *S. minuta*, washed all over with shades of smoke-grey, and with more black on the bill. Its immature plumage and its breeding-places are still unknown.

RHYNCHOPS MELANURA, Sw.

Rhynchops melanura, Swainson, An. in Menag. p. 340 (1838).

[No. 66 (♀), Coquimbo Bay, November 1881. Eyes brown.] Adult.

In their excellent treatise on the Neotropical Laridæ (P. Z. S. 1871, p. 566) Messrs. Sclater and Salvin deemed it advisable to unite under the specific name of *R. nigra* both the northern white-tailed form and the southern black-tailed one. This caution was mainly due to the fact that, amongst Mr. Salvin's white-tailed specimens obtained during winter in Central America, one example shows some dark markings in the middle of the lateral rectrices, thus intergrading with the southern dark-tailed bird. Recent examination of this specimen and the others in Mr. Salvin's extensive series, besides my own, leads me to the conclusion that the two forms are entitled to specific distinction, for the following reasons:—In the northern adult the upperside of the rectrices is almost entirely white, with only a little dusky colour in the central ones, the underside being pure white; the under wing-coverts are white; the secondaries are to a great extent white, and the upper primaries show a considerable margination of that colour. In the southern form, on the other hand, the rectrices on both their upper and under sides are dark smoke-colour, with merely a thin outside margin of a lighter tint; the under wing-coverts are dusky; the tips of the secondaries show far less white than in the northern bird; whilst the upper primaries can hardly be said to show any trace of lighter colour even in this Coquimbo specimen, which is a fully adult and a freshly-moulted example. The distinctions admittedly rest upon the respective preponderances of light and dark; and in the immature northern bird, such as I consider the Central-American example to which reference has been made, the tail is not so white as in the adult; nevertheless the two forms can be separated *at a glance at any age*. It is substantially correct to define the northern *R. nigra* as a white-tailed, and the southern *R. melanura* as a black-tailed bird. In the winter plumage both species show a more or less defined white collar.

There is a break in the chain of evidence respecting the intertropical range of these two species. Through the kindness of my friend Mr. E. Hargitt, I have specimens of the southern form, *R. melanura*, from as far north as Berbice, British Guiana, about lat. 6° N.; and it probably ascends the Orinoco, and passes along the coast of Venezuela. In this case the northern range of *R. melanura* in the Atlantic would come very close to the territory of the northern *R. nigra*, which is common in Florida, whence I possess examples. Under these circumstances the wonder is that the distinctions between the northern and southern forms should be so marked as they are.

XEMA FURCATUM (Neboux). (Plate XXXIV.)

Larus furcatus, Neboux, Voy. 'Vénus,' Atlas, pl. x. (1846), descr. Rev. Zool. 1840, p. 290.

Creagrus furcatus, Bp. Naum. 1854, p. 213; Salvin, Tr. Z. S. ix. p. 506.

Xema furcatum (Neboux), Saunders, P. Z. S. 1878, p. 210.

[No. 9, Paracas Bay, Peru, Oct. 1881. Eyes brown.]

The third known example of this rarest of Gulls, the history of which may here be briefly recapitulated. The Paris Museum possesses one, in somewhat immature plumage, said to have been obtained by Dr. Neboux, of the French frigate 'Vénus,' at Monterey, California, in the month of November. The British Museum has an adult in full breeding-plumage, obtained during the voyage of H.M.SS. 'Herald' and 'Pandora,' at Dalrymple rock, Chatham Island, Galapagos group, nearly on the equator, between the 11th and 16th January. It is a medium-sized Gull, with long wings (16 inches), a dark slate-coloured hood, and a forked tail; indeed were it not that the hood is separated from the base of the hill by a band of white feathers, and that there is no black neck-ring at the base of the hood, *Xema furcatum* might be described as a gigantic Sabine's Gull. In the young, now figured, the resemblance to the young of *Xema sabinii* is very marked. The entire head is white, with dark markings in front of and surrounding the eyes, and a brown auricular patch as in most of the immature hooded Gulls; neck and mantle ashy brown, the tips of the feathers margined with white; upper wing-coverts and secondaries white; primaries, 1–5 black with greater part of inner web white, 6 and 7 white barred with dusky, 8–10 pure white. Tail much forked, the outer feathers nearly white, the others banded with brown and tipped with white; rump white slightly mottled with brown. Underparts white. Bill horn-black; tarsi and feet livid brown. The bill is proportionately longer, slenderer, and more curved than in *X. sabinii*, from which it also differs in having a considerable bare space between the base of the feathers and the nares. The first primary which shows the slightest tip of white is the 5th, and there is less white at the tips of the upper ones than in the young of *X. sabinii*.

The feathers are all quite fresh, and, reasoning from analogy, I should think that this example cannot have been more than three or four months old. Where, then, are the head-quarters of this mysterious Gull? It would seem by this specimen that its breeding-time corresponds to that of the northern hemisphere, and that, like some other Gulls, it passes southwards to escape the northern winter; but as yet nothing is known. It is, however, somewhat remarkable that American naturalists who have devoted so much attention to the exploration of the coast of the Pacific, from Vancouver's Island down to Mexico, have discovered no trace of it; nor have repeated visits to the Galapagos produced more than the isolated adult specimen above noticed. Capt. Markham's valuable acquisition has now made us acquainted with the first plumage of this extremely rare bird; and the proof of the existence of this long-lost species may be expected to awaken an interest which will probably in a few years lead to the discovery of its real habitat.

XEMA SABINII (Sabine).

Larus sabini, J. Sabine, Tr. Linn. Soc. xii. p. 520 (1818).

Xema sabinii (Sabine), Saunders, P. Z. S. 1878, p. 209.

[Nos. 70 & 71 (♂ ♀), Callao Bay, Dec. 1881. Eyes black.]

Two specimens of this circumpolar species in the winter plumage of the second year: *i. e.* adult, but without the hood. In the primaries the white bottoms of the tips are so completely worn away as to give them the appearance of having been cut off squarely, showing that these flight-feathers are not renewed until January or February, as in the case of many of the Terns.

The occurrence of this species at Callao, in 12° S., further increases our knowledge of its winter range on the Peruvian coast, the most southern locality hitherto recorded being Tumbez in about 8° S. (Scl. & Salv. P. Z. S. 1878, p. 141), on the authority of Prof. Steere. On the Atlantic side this species has not yet been recorded as an autumn and winter visitant beyond the coast of France and the Bermudas.

LARUS FRANKLINI, Sw. & Rich.

Larus franklini, Sw. & Rich. F. Bor.-Am., Birds, p. 424 (1831); Scl. & Salv. P. Z. S. 1861, p. 577; Saund. *op. cit.* 1878, p. 195

[No. 11, no. 12 (♀), no. 13 (♂), no. 14 (♀), Coquimbo Bay, Nov. 1881. Eyes brown. No. 77, Payta, January 1882. Eyes black.]

This rather small Gull, with a dark slate-black hood in the nuptial dress, is now well known as a winter visitant to the Pacific coast as far south as Chili. Its breeding-grounds are in Manitoba and other northern portions of America, chiefly to the west of 90° W. long., or say, roughly, the prolongation of the line of the Mississippi.

LARUS SERRANUS, Tsch.

Larus serranus, Tschudi, Wiegm. Arch. 1844, pt. i. p. 314; Scl. & Salv. P. Z. S. 1871, p. 577; Saund. *op. cit.* 1878, p. 196.

[No. 10, Callao Bay, August 1881.]

A fine adult of this much larger species, with the full black hood of breeding-plumage. It is known to breed on the islands and shores of the Andean lakes; but its eggs and nestlings are, I believe, still undescribed. During the bad weather in the mountains it comes down to the Pacific coast; but as yet it has not been found on the eastern slope, nor in the Argentine provinces, the bird thus named by Burmeister being clearly *L. maculipennis*.

LARUS CIRRHOCEPHALUS, Vieill.

Larus cirrhocephalus, Vieillot, in 2nd ed. Nouv. Dict. Hist. Nat. t. xxi. p. 502 (1818); Saunders, P. Z. S. 1878, p. 204.

[No. 75 (♂), no. 76 (♀), Payta, January 1882. Eyes bright silvery grey; legs and beak red.]

Both these examples are adults, and even *old* birds, as evidenced by the size of the subapical mirror in the first and second primaries. But although the month of January corresponds to our midsummer, nevertheless these birds show only a little of the pale grey hood characteristic of the nuptial season. In Argentine specimens the hood is assumed from September onwards, and, following the usual rule with Gulls of the southern hemisphere, the birds may be expected to breed about November. Where this Gull breeds, however, is as yet a mystery, as is also the route by which it reaches the Pacific coast. All that is known is that it occurs on the coast, bays, and lakes of Brazil from about Rio de Janeiro down to Buenos Ayres, and up the La Plata and the Paraná; but accounts of its breeding-habits in those districts, such as those of Hudson (P. Z. S. 1870, p. 802, and 1871, p. 4), really apply to a totally different species, namely *L. maculipennis*, Licht. Without any connecting links in the chain of distribution, *L. cirrhocephalus* makes its appearance on the coast of Peru, these two examples making the third and fourth known to me from there, its range on the Pacific side being from the Chincha Islands, in about 13°, to Payta in 5° S. lat.

In this connexion it is necessary to point out an error into which my friend Mr. R. B. Sharpe has fallen, owing to the want of genuine specimens of this Gull in the British Museum, a deficiency which I have since supplied. In his Report on the birds collected by Dr. Coppinger, of H.M.S. 'Alert' (P. Z. S. 1881, p. 16), Mr. Sharpe, under the name of *L. cirrhocephalus*, has included two other and perfectly distinct species. His no. 87 is really *L. glaucodes*, Meyen (as is also his no. 51, which is rightly named), a species with a black or dark brown hood (similar in that respect to our *L. ridibundus*), which ranges from the Falklands to the coast of Chili. On the other hand his nos. 68 and 69 are respectively young and adult of *L. maculipennis*, Licht., another *dark*-hooded Gull, very close to *L. glaucodes*, but from which it is distinguishable by the wing-pattern. Hitherto *L. maculipennis*, which is the common Argentine species, has not been known to occur beyond the Chuput valley, Eastern Patagonia, 43° S.; and this is the first time it has been obtained on the Pacific coast. It was already sufficiently remarkable that two such very closely allied and yet perfectly distinguishable species of Gull as *L. maculipennis* and *L. glaucodes* should be coexistent within so limited an area; but now that their range is shown to intersect, it is stranger than ever. Reverting to *L. cirrhocephalus*, which has been so repeatedly confused with totally distinct species, it may be excusable to repeat that it has a *pale grey* or *lavender hood*, slightly darker on the neck, and that the only species with which it can be confounded is its South-African representative *L. phæocephalus*, Sw.

LARUS BELCHERI, Vigors.

Larus belcheri, Vigors, Zool. Journ. iv. p. 358; Scl. & Salv. P. Z. S. 1871, p. 575; Saund. *op. cit.* 1878, p. 182.

[No. 4, San Lorenzo Island, Callao Bay, August 1881. Eyes brown, legs yellow.
No. 7, Callao Bay, August 1881.
No. 8, Coquimbo Bay, November 1881.]

The first is an adult with pure white head and underparts; the second is in the brown plumage of the first year; the third is a bird of the second year which has already assumed the dark mantle of the adult, but still retains the brown hood and slightly mottled underparts indicative of immaturity.

This stoutly built species is a very remarkable Pacific form, uniting, as it does, all the main features in which the Gulls of the Pacific differ from those of the Atlantic. In the immature stage it has an exceedingly well-marked hood, which it afterwards loses; in the adult stage it still retains a very defined black bar on the rectrices. Altogether it resembles *L. crassirostris* of Japan far more closely than any other; but it is a coarser species, and has a more defined hood in the immature plumage than the Japanese bird.

Larus modestus, a more slender but very characteristic species frequenting the coasts of Peru and Chili, but of the breeding-place of which no authentic accounts have yet appeared, is not represented in this collection. Another and very rare Gull, hardly a dozen examples of which are known to exist, is *Larus fuliginosus*, a dark sooty bird with a hood at all seasons, restricted to the Galapagos group.

LARUS DOMINICANUS, Licht.

Larus dominicanus, Licht. Verz. Doubl. p. 82 (1823); Scl. & Salv. P. Z. S. 1871, p. 576; Saund. *op. cit.* 1878, p. 180.

Five specimens in various stages of plumage from Coquimbo and Callao. This widely distributed black-backed Gull appears to replace in the southern hemisphere the northern *L. marinus*.

STERCORARIUS POMATORHINUS (Temm.), Saund. P. Z. S. 1876, p. 324.

♂ ♀, Callao Bay, December 1881.

Two examples of this circumpolar parasitic Gull, apparently in second and third year. These are the first specimens on record from the South Pacific, its previous occurrence in that ocean reaching no further than the latitude of Inosima, Japan (P. Z. S. 1877, p. 800). Callao is also by about three degrees the most southern latitude yet reached, Cape York, North Australia, being the nearest. It is probably a regular visitant to the Peruvian coast, several observers having remarked medium-sized Skuas pursuing the other Gulls, although, until now, the species could not be identified. Unless specimens are actually obtained, it is, however, unsafe to conclude that any species observed pursuing and robbing other sea-birds must necessarily be a Skua of some kind: on the contrary, many other Gulls have similar habits, amongst which may be mentioned *Larus belcheri* and *Larus heermanni* in the Pacific, *Larus atricilla* (see E. Coues, B. N. W. p. 653), *Larus hemprichi* in the Red Sea, and, in all probability, many more.

STERCORARIUS CHILENSIS (Bonap.), Saund. P. Z. S. 1876, p. 323.

One, Callao Bay. This locality is the most northern yet recorded for this southern representative and close ally of *S. catarrhactes* of the northern hemisphere.

In a paper recently published by M. Alph. Milne-Edwards (Ann. Sc. Nat. (6) xii. art. 7), "Sur la Faune des régions australes," he inclines to the belief that the type from which the large short-tailed Skuas *Stercorarius catarrhactes*, *S. chilensis*, and *S. antarcticus* are derived belonged originally to the antarctic regions. The first is now confined to the northern hemisphere, in which alone all the other known species of Skua have their breeding-places, and the balance of probability would therefore seem to be rather in favour of a northern origin; but, after all, this is mere conjecture. With regard to the other Gulls I will quote his exact words:—"Cette étude montre que les Goëlands et les Mouettes de la région antarctique ne présentent rien que puisse caractériser la faune de cette partie du globe, et que les espèces ou races qui y vivent sont probablement des dérivés des oiseaux du même genre qui abondent dans l'hémisphère nord." It would be unsatisfactory to enter into arguments as to the probability of the short-tailed Skuas having had their origin in the southern, whilst all the other Gulls had their origin in the northern hemisphere; but inasmuch as the *Alcidæ* proper are now generally admitted to be connected with the *Laridæ* on the one side, as the *Laridæ* are connected with the *Limicolæ* on the other, and as the *Alcidæ* are only known to inhabit the *northern* hemisphere, it would appear more probable that the *Laridæ*, or at least the *Larinæ*, had their origin there also. There are, however, some very remarkable points about the Gulls of the southern hemisphere, especially with relation to the Pacific, of which M. Milne-Edwards seems to be unaware, and upon which I should like to offer a few observations.

Throughout the northern hemisphere, exclusive of the shores washed by the Pacific, the Gulls (with the exception of the three arctic genera *Rissa*, *Pagophila*, and *Rhodostethia*) fall into two well-marked groups—those in which the adults bear a coloured hood during the breeding-season, and those which never have a hood at any time. In all the members of both of these groups the immature birds have a dark band across the rectrices, which disappears as they approach maturity. Several representatives of each of these groups also inhabit the southern hemisphere—*Larus cirrhocephalus* of South America, and its close ally *L. phæocephalus* of South Africa, *L. maculipennis*, *L. glaucodes*, and *L. serranus* of South America, belonging to the former; *L. dominicanus*, found from New Zealand to South America (by way of the Cape of Good Hope, not through the South Pacific), *L. bulleri*, *L. scopulinus*, *L. novæ-hollandiæ*, and *L. hartlaubii*, found at or between New Zealand and the Cape of Good Hope, belonging to the latter group. But it is only in the Pacific (merely including in that area the desolate islands of South Shetland, the Falklands, and a portion of Patagonia near the eastern entrance of the Straits of Magellan) that we find several species of Gulls which agree with the other forms in having a band across the rectrices in the immature stage, but differ from them in many other respects. Most of these species are of a coarse heavy build, and have a tendency to a sooty hue on the underparts; but their principal characteristic is the presence of a more or less defined *hood* in the *immature* stage, which is generally *lost* in the *adult* plumage. *L. scoresbii*, which extends beyond the Pacific to the Falklands, varies least in this respect from the general type of Gulls; it has a well-defined hood in youth, but loses the hood with the disappearance of the bar on the tail, which becomes white. Its range is but little beyond that of the Cape-Horn current. *Larus belcheri*, distributed along the whole coast-line of Chili and Peru washed by Humboldt's current of cold water, has a hood in youth only; but it has a barred tail at all ages, the black predominating over the white. The species most nearly resembling it in the adult plumage is *Larus crassirostris*, of the Pacific coasts of Japan and China, in which, however, the amount of black and white in the rectrices is nearly equal; nor has the young so well-marked a hood; its mantle also is lighter, and its other characteristics are so far modified as to make it intermediate between the Old-World and the South-Pacific Gulls. The line of communication of the ancestor of these forms, which now constitute two well-marked species, was probably, unless the direction of currents has materially altered, by Humboldt's current northwards to the equator, thence across the comparatively feeble and conflicting equatorial currents, until the north equatorial drift led to the shores of Japan.

On the coast of California occurs *Larus heermanni*, another member of this group, with an entirely black tail, and a hood in the immature state; the head gets lighter with age, but the underparts are washed with the dark grey so characteristic of Pacific forms. It has no very close ally in existence; for *Larus modestus*, a much slenderer Gull, restricted to the coasts of Peru and Chili, only resembles it in the hood of immaturity and in general coloration, and differs from it in having a tendency to lose the black markings on the rectrices with advance in age. And the isolated *Larus fuliginosus*, found only in the Galapagos group, differs from the other Pacific Gulls in having a *hood* at *all* ages and in losing the markings on the rectrices at maturity. It would seem as if this smoke-coloured species, stranded at the Galapagos, might be the nearest living representative of the ancestor of all these Pacific forms, and the one which at the same time links them to the type of the northern hemisphere.

Between South America and the neighbourhood of New Zealand and Australia only Terns are found, no Gull of any kind being on record. Even *L. dominicanus* is absent from the South-Pacific islands, its line of connexion between South America and New Zealand being by the South Atlantic. But along the southern shores of Australia, from King George's Sound to Tasmania, and (according to the labels on the specimens obtained by the Antarctic expedition) in New Zealand, is found a large dark-mantled Gull, *Larus pacificus*, Lath., which has an immense blunt bill of peculiar form, somewhat like that of *L. scoresbii*, and further resembles the Pacific group in that the adult has a broad black band across the rectrices. It is an isolated form; but although it may be difficult to explain its existence at the junction of the waters of the South Pacific and South Atlantic, the fact seems worthy of attention.

Apart from conjectures, there can be no doubt that the connexion between the pelagic birds of the northern and southern hemispheres is much closer in the Pacific than in the Atlantic. The closer resemblance between *Stercorarius catarrhactes* and *S. chilensis* than between the latter and its present near neighbour, *S. antarcticus*, is one proof of this; the intermediate position occupied by *Sterna aleutica* of the Aleutian Islands, between the ordinary type of northern Tern and the intertropical group of sooty Terns, is still further evidence; but the strongest of all is perhaps in the case of *Xema sabinii* and *X. furcatum*. The former, a circumpolar species not known to breed south of the arctic circle, except on the shores of Behring's Sea, extends its breeding-range in the North Pacific as far south as Alaska; and not only the young birds, which are always great wanderers, but also the adults of this species come down in winter as far as 12° S. lat., thus considerably overlapping the range of its larger congener *X. furcatum*. The latter, owing to its restriction to the Pacific, has acquired some of the special characteristics of the Pacific Gulls; but there can be no doubt that these two surviving species of hooded *fork-tailed* Gulls must have had a common origin at no very remote period. The main factors in causing this approximation are, probably, the North-Pacific drift-current, which sweeps past the Aleutian Islands, down the coast of California to Mexico, at least as far as Acapulco; and the cold Humboldt's current, abounding with fish, coming from the south and refreshing the coasts of Peru and the Galapagos. No greater contrast can be imagined than that between the vicinity of the Chincha Islands, swarming not only with Gulls and Terns, but with Gannets, Boobies, Pelicans, Cormorants, and Petrels literally by millions, and the comparatively unaviferous coast of Brazil in about the same latitude, say from Pernambuco to Bahia, along which a warm stream flows.

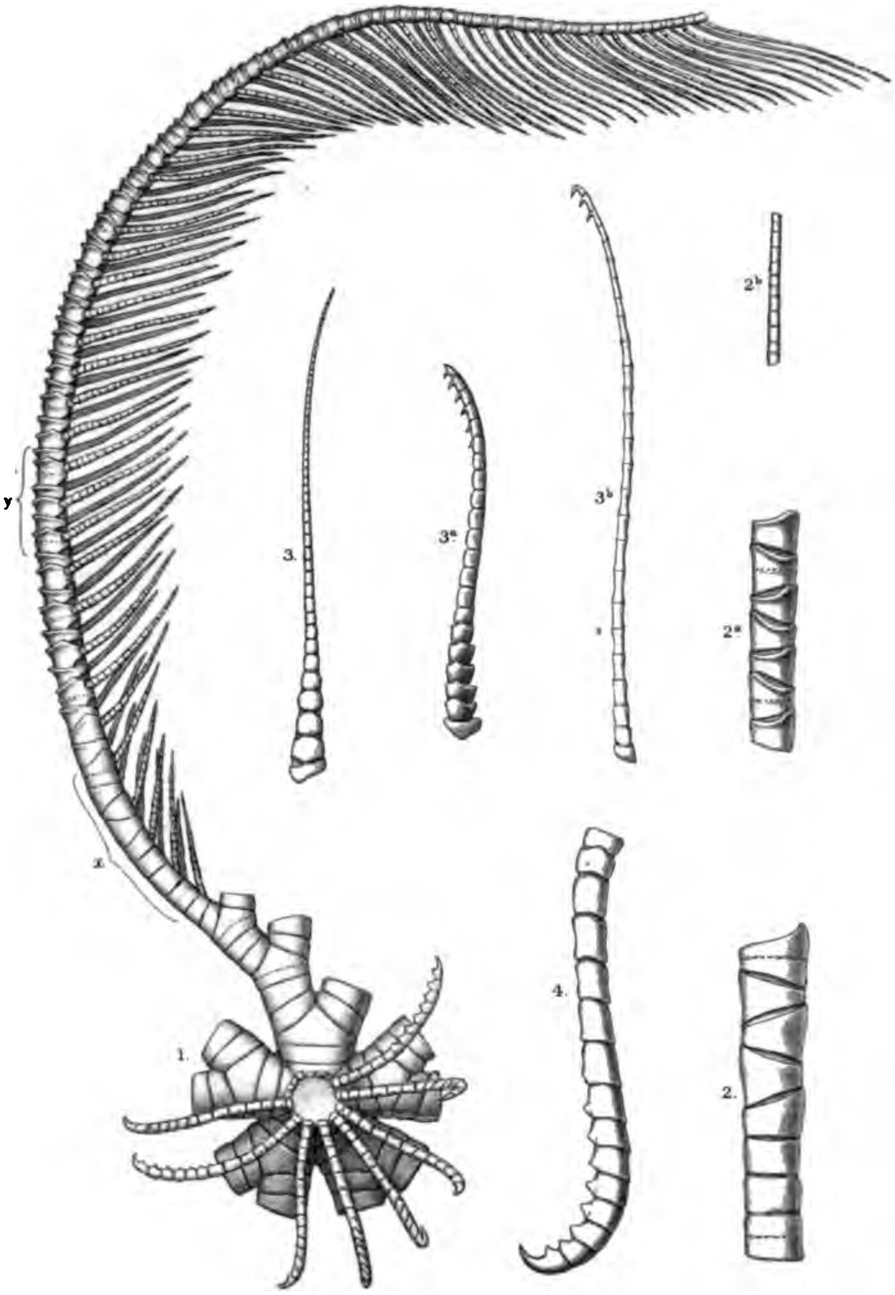
My heartiest thanks are due to Capt. Markham for the very interesting collection that has formed the subject for this paper; would that in the navy there were more like him! Every few years some of our men-of-war visit the Galapagos group; but no attempt at a systematic exploration of the archipelago appears to have been made since the visits of the 'Adventure' and 'Beagle' in 1835; and that was in all probability owing, in a great measure, to the presence of the late Mr. Charles Darwin. It is almost certain that, if not only this group, but the other remote islands of the equatorial and northern Pacific were thoroughly explored, much important light would be thrown upon the distribution of species and the connexions which have existed between many which are now restricted either to the northern or to the southern hemisphere.

8. An Attempt to apply a Method of Formulation to the Species of the *Comatulidæ*; with the Description of a new Species. By F. JEFFREY BELL, M.A., F.Z.S., Professor of Comparative Anatomy in King's College.

[Received May 16, 1882.]

(Plate XXXV.)

A zoologist who has been at work for a quarter of a century, more or less, and on whom the growth of zoological literature has been somewhat gradual, will hardly perhaps be greatly affected by the already enormous mass of descriptive and illustrative literature which appears in the journals of societies and other serial publications. The younger student, however, cannot look so calmly on the piles of papers that lie behind him, and the manifold sheets that are daily laid in his way.



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ACTINOMETRA ANNULATA.

If science is not to be overwhelmed by literature, an alternative is only to be found in such abbreviation as the mathematician, the physicist, and the chemist have already adopted, or in some form of the modern weapon, the clôture. It is unnecessary to insist on the advantage of the former.

Recognizing the force of these considerations, I proposed last year to this Society a method of formulating the results attained to, as regards our knowledge of the specific characters of the members of the genus *Asterias.* For the purpose of extending the process as much as possible, I select on this occasion a different group of the Echinodermata.

I cannot pass directly to the subject without expressing my satisfaction with the knowledge that Dr. Vosmaer, of Leyden, has invented a kind of short-hand for the description of Sponges, which will, I hope, bring him before long to a system of formulation.

When we make a general survey of the two genera which contain by far the greatest number of the Comatulidæ, *Antedon* and *Actinometra,* we note that,

(1) As a general rule, the arms are ten in number or more than ten; the joints before the first division are called *radials,* those before the second *distichals*; if there is a further division we shall have *palmars*; while the separate joints after the final division are known as the *brachials.*

(2) The leading differences between these sets of joints in different species are to be found in the varying arrangement of that mode of union to which Johannes Müller applied the term syzygial.

(3) The cirri on the centrodorsal vary in number, and in the number of their joints.

If (1) we use the letters *R, D, P* for the radials, distichals, and palmars respectively, and insert them in the formula whensoever the respective axillary is a syzygy, we may (2) distinguish which of the first three brachials (one of which is, with but very rare exceptions, a syzygy) is a syzygy by simply making use of the number 1, 2, or 3. Thirdly, the cirri and their number may be thus formulated: if there are from 1–12 cirri, we may say there are few; if from 12–30, a moderate number; and if more than 30, a large number: if there are not more than 20 joints to the cirri we may look upon them as being few, if from 20–40 moderate, and if more than 40 numerous. I propose to use the letters *a, b,* and *c* to represent few, moderate, and numerous respectively; while the letter for the number of cirri will form the numerator, and that for the number of joints the denominator of a fraction; and where there is a difficulty of decision one might write *ab* or *bc.*

Antedon and *Actinometra* may be usefully, though not of necessity, distinguished by making *A* or *A'* part of the formula.

One or two examples will explain the aim of this note. If we have a ten-rayed *Antedon* with 15 cirri of 40–50 joints, with its first syzygy on the third brachial, we may write its formula thus, $3\ \mathrm{A}\ \frac{\mathrm{b}}{\mathrm{c}}$; so, again, 1 A'RP $\frac{a}{c}$ is the formula for a multiradiate[1] *Actinometra* with its radial and palmar (though not its distichal) axillaries syzygies, with a syzygy on its first brachial, with less than 13 cirri, and more than 40 cirrus-joints.

When a character frequently though not always obtains, the corresponding letter is put within brackets: thus 3AR(P) $\frac{a}{c}$ would be the formula of a species of *Antedon* in which, though the radial and third brachial joints were always syzygial, the palmar axillary was only sometimes so; in those rare cases in which divisions extend beyond the palmars, I have made use of the symbols *P'* and *P''*.

In the lists that follow, the greater number of described species of *Antedon* and *Actinometra* will be found enumerated and their formulæ given; in addition there are given the names and formulæ of some new forms that have been lately collected by Dr. Coppinger, of H.M.S. 'Alert,' the descriptions of which will be shortly published elsewhere.

As in the paper on *Asterias*, I have given only one reference to the description of each species. In addition to the heavy debt which I owe to the published writings of Mr. P. Herbert Carpenter, I have to add that the formulæ of some of the species of Johannes Müller are given with more satisfactory knowledge than the rest, owing to the fact that Mr. Carpenter, in a manner of which I know not whether the scientific liberality or the amiable friendliness is the more remarkable, has provided me with copies of the notes made by him on the specimens which formed the bases of Müller's descriptions. Mr. Herbert Carpenter's two papers referred to in the following lists are to be found (i.) in the 'Notes from the Leyden Museum,' vol. iii., and (ii.) in the 'Bulletin of the Museum of Compar. Zoology,' ix. no. 4. The references to Johannes Müller's 'Ueber die Gattung *Comatula*' refer to the pagination of the separate copies; Count Pourtales's papers are to be found in, respectively, (i.) Bull. M. C. Z. no. 6, (ii.) B. M. C. Z. no. 11, and (iii.) B. M. C. Z. v. no. 9. The other references will explain themselves.

I. LISTS OF DESCRIBED SPECIES.

(a) ANTEDON.

1. *adeonæ*, Müll. p. 15.
2. *alata*, Pourt. iii. p. 215.
3. *armata*, Pourt. ii. p. 356.
4. *articulata*, Müll. p. 27.
5. *bimaculata*, Carp. i. p. 186.
6. *brevicuneata*, Carp. i. p. 187.

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[1] When D or P appear in a formula it is clear the species must have more than 10 rays, because of the meaning of the words those letters represent; where, however, neither distichals nor palmars present a syzygial joint, it will be necessary to make use of the mathematical sign for the square root to mark the fact of its being a multiradiate species.

7. *carinata*, Müll. p. 16.
8. *celtica*, Duncan and Sladen, Arctic Echinod. p. 75.
9. *cubensis*, Pourt. ii. p. 356.
10. *dubeni*, Bölsche, Arch. für Nat. 1866, p. 92.
11. *elongata*, Carp. i. p. 183.
12. *eschrichtii*, Duncan and Sladen, Arctic Echinod. p. 73.
13. *flagellata*, Carp. i. p. 183.
14. *granulifera*, Pourt. iii. p. 215.
15. *hageni*, Pourt. i. p. 111.
16. *jacquinoti*, Müll. p. 19.
17. *lævicirra*, Carp. i. p. 189.
18. *lævissima*, Grube, JB. schl. Ges. 1875, p. 74.
19. *macronema*, Müll. p. 22.
20. *meridionalis*, Pourt. ii. p. 355.
21. *mertensi*, Grube, JB. schl. Ges. 1875, p. 74.
22. *milberti*, Müll. p. 19.
23. *milleri*, Müll. p. 15.
24. *palmata*, Müll. p. 25.
25. *perspinosa*, Carp. i. p. 178.
26. *petasus*, Müll. p. 17.
27. *phalangium*, Müll. p. 17.
28. *philiberti*, Müll. p. 23.
29. *pinniformis*, Carp. i. p. 180.
30. *prolixa*, Duncan and Sladen, Arctic Echinod. p. 77.
31. *reynaudi*, Müll. p. 23.
32. *rosacea*, W. B. Carpenter, Phil. Trans. 1866.
33. *rubiginosa*, Pourt. ii. p. 356.
34. *sarsi*, Müll. p. 18.
35. *savignii*, Müll. p. 21.
36. *serripinna*, Carp. i. p. 182.
37. *spicata*, Carp. i. p. 190.
38. *spinifera*, Carp. ii. p. 8.

(β) ACTINOMETRA.

1. *alternans*, Carp. i. p. 208.
2. *brachiolata* (*rosea*), Müll. pp. 13, 14.
3. *bennetti*, Carp. i. p. 212.
4. *borneensis*, Grube, JB. schl. Ges. 1875, p. 75.
5. *echinoptera*, Müll. p. 14.
6. *fimbriata*, Müll. p. 22.
7. *japonica*, Carp. i. p. 202.
8. *jukesi*, Carp. Proc. Roy. Soc. 1879, p. 390.
9. *multifida*, Müll. p. 26.
10. *multiradiata*, Müll. p. 25.
11. *novæ-guineæ*, Carp. i. p. 193.
12. *parvicirra*, Carp. i. p. 204.
13. *peronii*, Carp. i. p. 214.
14. *pulchella*, Carp. ii. p. 10.
15. *robustipinna*, Carp. i. p. 201.
16. *rotalaria*, Müll. p. 20.

17. *schlegelii*, Carp. i. p. 210.
18. *solaris*, Müll. p. 12.
19. *trichoptera*, Müll. p. 21.
20. *typica*, Lovén, Œfv. K. Vet.-Akad. Förh. 1866, p. 231.
21. *wahlbergi*, Müll. p. 20.

In the succeeding lists the names are mentioned and the formulæ given of some new species from the Australian seas, full descriptions of which I hope to be able to publish at an early date.

II. LISTS OF FORMULÆ.

ANTEDON[1].

adeonæ …………	$3\,A\,\frac{b}{b}$.
armata …………	$\times\,A\,\frac{b}{b}$*.
articulata ………	$\sqrt{3\,A\,\frac{c}{b}}$.
bimaculata ……	$\sqrt{3\,A\,\frac{c}{}}$.
brevicuneata ……	$\sqrt{3\,A\,\frac{b}{b}}$.
briareus …………	$3\,AD\,\frac{b}{a}$.
carinata …………	$3\,A\,\frac{b}{b}$.
celtica[2] …………	$3\,A\,\frac{c}{b}$.
decipiens ………	$3\,AD\,\frac{b}{b}$.
dubeni …………	$3\,A\,\frac{b}{ab}$.
elegans …………	$3\,AD\,(P)\,\frac{b}{c}$.
elongata…………	$\sqrt{3\,A\,\frac{b}{b}}$.
eschrichti ………	$3\,A\,\frac{c}{c}$.
flagellata ………	$\sqrt{3\,A\,\frac{b}{b}}$.
insignis …………	$3\,A\,\frac{b}{\times}$.
irregularis………	$3\,AD\,\frac{b}{b}$.
jacquinoti ………	$3\,A\,\frac{b}{b}$.
lævicirra ………	$\sqrt{3\,A\,\frac{b}{b}}$.
loveni……………	$3\,A\,\frac{b}{a}$.
macronema ……	$3\,A\,\frac{bc}{c}$.
microdiscus ……	$3\,ADP\,\frac{b}{c}$.
milberti …………	$3\,A\,\frac{b}{b}$.
palmata …………	$3\,A\,\frac{b}{b}$.
perspinosa………	$3\,A\,\frac{a}{c}$.
phalangium ……	$3\,A\,\frac{b}{c}$.
pinniformis ……	$3\,A\,\frac{a}{b}$.
prolixa …………	$3\,A\,\frac{c}{c}$.
reginæ …………	$\sqrt{3\,(5)\,A\,\frac{b}{b}}$.
reynaudi…………	$?\,3\sqrt{AR\,\frac{b}{c}}$.
rosacea …………	$3\,A\,\frac{bc}{a}$.
sarsi ……………	$\times\,A\,\frac{c}{ab}$.
savignii …………	$\times\,AD\,\frac{b}{b}$.
serripinna ………	$3\,A\,\frac{a}{a}$.
spinifera…………	$\sqrt{\times\,A\,\frac{ab}{c}}$.

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[1] Several of the species of this genus and of *Actinometra* diagnosed by Count Pourtales are too briefly described for us to be able to include them in these lists.

* The sign × in a formula is to be understood to signify that information with regard to a certain character has not yet been obtained.

[2] Of Marenzeller and Sladen; see Zool. Anz. iv. p. 520.

ACTINOMETRA.

albonotata	$1A'R\frac{b}{ab}$.	parvicirra	$3A'DP\frac{(b)}{a}$.
alternans	$3A'RPP''\frac{o}{o}$.	paucicirra	$1.2.A'RD\frac{a}{a}$.
brachiolata (rosea)	$1.2.A'R\frac{b}{b}$.	peronii	$3A'RDP\frac{b}{b}$.
bennettii	$3A'RDP\frac{c}{b}$.	pulchella	$(1.2)3A'\frac{a}{b}$.
borneensis	$2AD\frac{b}{b}$.	robustipinna	$A'(D)P\frac{c}{\times}$.
coppingeri	$3A'\frac{b}{a}$.	rotalaria	$3A'(P)\frac{a}{\times}$.
echinoptera	$3A'\frac{b}{a}$.	schlegeli	$3A'RDP\frac{ab}{\times}$.
fimbriata	$2A'D\frac{b}{ab}$.	solaris	$1.2.A'R.\frac{b}{a}$.
japonica	✓ $\overline{3A'R\frac{c}{b}}$.	trichoptera	$3A'D\frac{b}{a}$.
multifida	$3A'D\frac{b}{a}$.	typica	$1A'RD\frac{o}{o}$.
multiradiata	$2A'RDP\frac{b}{b}$.	variabilis	$3A'D(P)\frac{a}{a}$.
novæ-guineæ	$1(2)A'RDP\frac{b}{\times}$.	wahlbergi	$3A'D(P)\frac{b}{b}$.

ACTINOMETRA ANNULATA. (Plate XXXV.)

Centrodorsal discoidal flat, with about 15 marginal cirri, in one row, of about 15 joints, none of which are much longer than broad, though the third, fourth, and fifth are a little so; the succeeding joints have distinct though not prominent spines, though they are not always present on all of them.

Forty arms; the divisions very regular.

First radials visible, second very wide, in contact, third also very wide, not a syzygy. Three distichals and three palmars, the axillaries syzygies. First brachials wide, in contact; the third brachial a syzygy; after the sixth the wedge-shape rapidly becomes apparent, and the joints strongly overlap on either side alternately; the free edges of the joints may present delicate denticulations. Some way out the wedge-form diminishes; and then, owing to the strong projections of the ridges, the arms appear somewhat as though they were ringed.

Brachial syzygies: third, tenth, fourteenth, and then at about every fourth joint.

The second pinnule, which is on the second palmar, is only a very little longer than the first; both are made up of a large number of small joints; the fourth or fifth pinnule is short and fleshy. Further out the pinnules are again longer and their joints elongated and delicate.

Arm nearly or quite 100 mm. long; diameter of disk 10 mm.; cirri 8 mm. long.

Cape York, North Australia. Coll. B.M.

EXPLANATION OF PLATE XXXV.

- Fig. 1. *Actinometra annulata*, showing the disk with its cirri, the mode of division of the arms, and one arm along the whole of its uninjured extent.
- 2. View of part (fig. 1, *x*) of the dorsal surface of the arm.
- 2 *a*. View of dorsal surface further out (fig. 1, *y*).
- 2 *b*. View of ditto, near the tip: all × 4.
- 3. The first pinnule (of 50 joints), × 3.
- 3 *a*. A pinnule (of 21 joints) near the middle of the arm, × 6.
- 3 *b*. A pinnule (of 26 joints) from near the end of the arm, × 6. The hooks on the free ends of the later pinnules are shown.
- 4. A cirrus, × 6.

4. On the Identity of *Anguilla kieneri*, Günther, with a Gadoid *Lycodes*. By Francis Day, F.Z.S.

[Received May 26, 1882.]

In the 'Annals and Magazine of Natural History,' 1874 (xiii. pp. 138, 139), Dr. Günther gave some notes upon fishes obtained at considerable depths in the North Atlantic, remarking (p. 139) that "a small *fourth* bottle contains only one specimen; it is labelled, in Mr. Couch's handwriting, '*Ophidium*—eel-like, deep sea—1869. H.M.S. 'Porcupine.' 180 fathoms.' This specimen is the young of *Anguilla kieneri*, a species hitherto known from the Mediterranean only." The capture of this so-called "eel" is part of the evidence adduced to prove "that fishes hitherto known from more southern latitudes occur in the North Atlantic at a moderate depth (of between 80 and 200 fathoms)."

It was with some interest that I commenced my examination of this British fish, which had been placed in such dissimilar positions in the ichthyological system, viz. by Couch among the Gadoids, by Günther among the Eels. The first thing that struck my attention was that it possessed small and jugular ventral fins and non-imbricate scales on the body, and was evidently widely separated from the Eels Spineless, with its vertical fins confluent, a narrow gill-opening, th gill-membranes attached to the isthmus, and the upper jaw longe than the lower, it was evidently a Gadoid (as characterized in th British-Museum Catalogue), but had not the wide gill-openings fishes belonging to the genus *Ophidium*, in which Couch had located i but the narrow ones of the Lycodontidæ, and appertained to *Lycode*

Lycodes is not a Mediterranean form, but is found in Arctic Ameri and Greenland, from which wanderers may extend southwards; f this genus has been shown to possess more species than any oth deep-sea Arctic form at present known.

Naming such a young example of *Lycodes*, or instituting a ne designation for the reception of this specimen, would be open strong objections[1]. Soon after it was captured it was evident placed in very strong alcohol, and as a result has stiffened, shrivelle and contorted into an unnatural shape. Irrespective of this,

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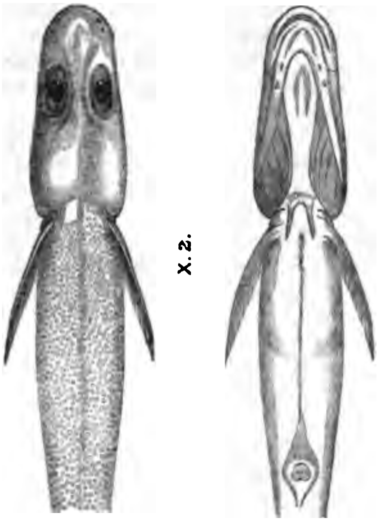
[1] Until it can be ascertained what species it is the young of, the specim may be termed *Lycodes kieneri*, Günther.

Collett has remarked, to determine the species of this genus is at all times difficult, owing to the unsatisfactory condition of the older type specimens, as well as the great individual variations in proportions, colour, and amount of scaling that occur among examples of the same species, and which may sometimes be due to sexual conditions. It admits of the clearest proof that the young and adult individuals of the same species exhibit marked dissimilarity.

The example is 3½ inches in length; its head is one seventh of the total length, and the greatest height of the body one fourteenth of the total length; the height of the head is two fifths of its length, and but little less than its width. Eyes comparatively large, being about one fourth of the length of the head, one diameter from the end of the snout, and less than one diameter apart. Teeth in the jaws, vomer, and palate. Scales existing from the head and back of the pectoral fin backwards over the body. It seems as if only one lateral line were present. The fins are too much stiffened for it to be possible to count the fin-rays; the pectoral turned forwards reaches the middle of the eye; the ventrals, consisting of one or two rays each, are rather more than half as long as the eye. No open glands are visible on the cheeks and gill-covers; but three are placed along the edge of the upper jaw, and some along the lower jaw.



Lycodes kieneri (Günther), ♀.

My principal reasons for directing attention to this specimen are, first, to point out that the Mediterranean *Anguilla kieneri* has not yet been obtained from our coasts, and consequently is not entitled to any place in the British Fauna; secondly, to show that the Arctic genus *Lycodes* is represented by this wrongly determined specimen. But to what species the fish belongs I do not consider sufficient data are at hand on which to form a definite opinion.

5. On Crustaceans from the Mauritius.—Part II.

By EDWARD J. MIERS, F.L.S., F.Z.S.

[Received June 1, 1882.]

(Plate XXXVI.)

Of the interesting Crustaceans of which I submit descriptions as a sequel to my former paper on Crustaceans received by the British Museum from M. V. de Robillard, the first to be mentioned, a *Palinurus*, was taken in a fishing-net at a depth of 40 fathoms. With it were sent, with other marine animals, a specimen of a species of *Dromia* (apparently *D. vulgaris*[1]) completely covered with a sponge of the genus *Dysidea*; and also a specimen of *Lysiosquilla maculata*, one of the commonest and best-known of the Oriental Squillidæ, of which, however, there were previously no specimens from the Mauritius in the British-Museum collection, and which is marked as "rare" by M. Robillard.

The Crawfish, of which a detailed description follows, and which belongs to the restricted genus *Palinurus* of Gray[2], I regard as specifically identical with a West-Indian form long since described and roughly figured by Parra[3] under the designation "Camaron de lo alto," which M. H. Milne-Edwards[4] has briefly described as *Palinurus longimanus* from a West-Indian type in the collection of the Paris Museum. M. Guérin-Méneville[5] also mentions this species, but without adding any thing to our knowledge respecting it; and yet more recently Dr. Edward v. Martens[6] has published a few remarks upon a male example obtained at Cuba by Dr. J. Gundlach. Thus the West-Indian habitat of *P. longimanus* is established beyond question.

The original description of Parra, although of considerable length, is, as might be expected in so early a work, insufficient from a scientific point of view; but as far as it goes it is applicable in almost every particular to the species from the Mauritius. Nevertheless, as

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[1] I have already, Ann. & Mag. Nat. Hist. (ser. 5) v. p. 370 (1880), remarked on the occurrence of this species in the Oriental region.

[2] I may observe here that Dr. G. Pfeffer, in a memoir on the *Palinuridæ* in the collection of the Hamburg Museum (Verhandl. des naturwissenschaftlichen Vereins von Hamburg-Altona, v. p. 30, 1881), has proposed for the subgenus *Panulirus* of Gray (ined.?) and Heller (1865), which includes by far the greater number of known Crawfishes, and has been generally adopted, the new designation *Senex*. This name cannot be adopted, having been long ago preoccupied in the class Aves; and I will add that, in my opinion, it would be productive of much inconvenience were a generic name liable to alteration merely because (as in the present instance) it is composed of the transposed letters of another name; to cite only one instance, it would then become necessary to name nearly all the older genera of Fish-lice (*Cymothoidæ*).

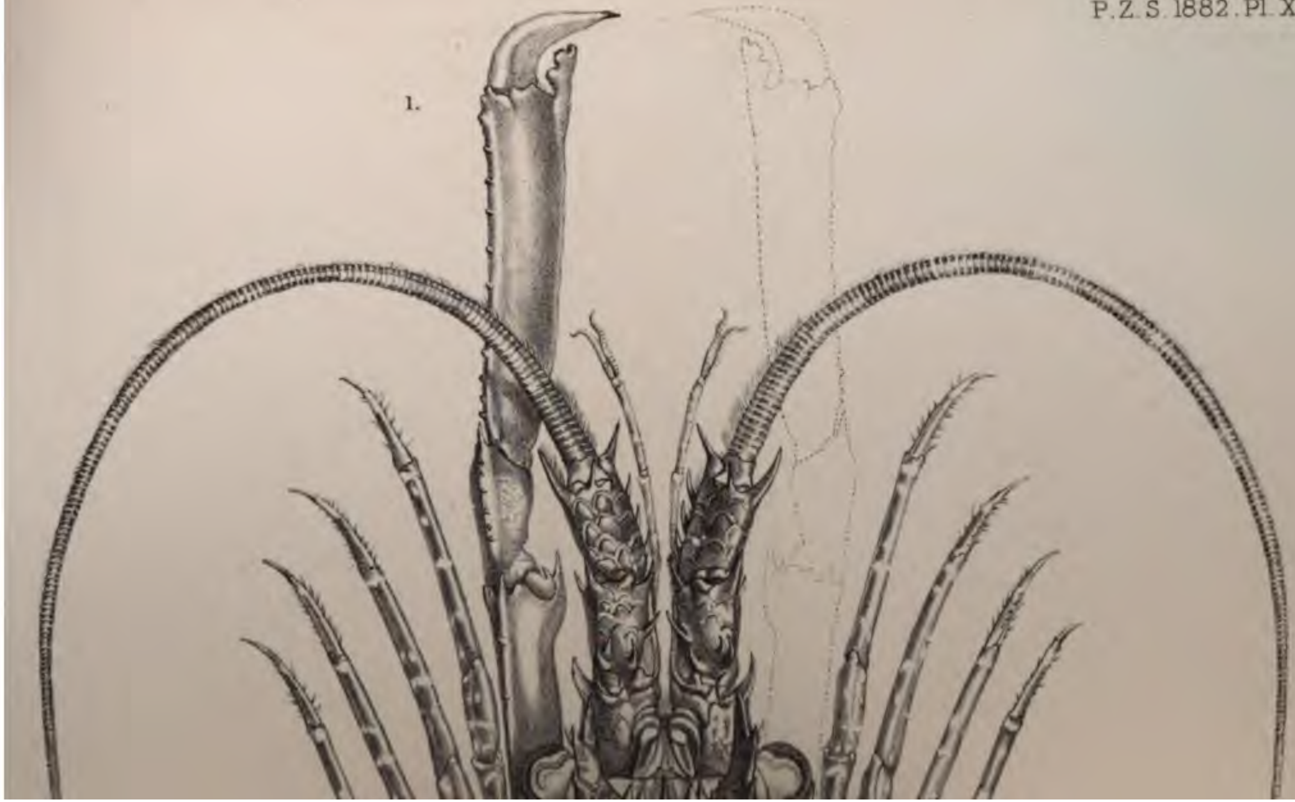
[3] Descripcion de diferentes Piezas de Historia natural, &c., p. 154, pl. lv. fig. 1 (1787).

[4] Histoire naturelle des Crustacés, ii. p. 294 (1837).

[5] "Anim. Articulés," in R. de la Sagra's Hist. de l'île de Cuba, p. xciii (1857).

[6] Archiv f. Naturgeschichte, xxxviii. p. 125 (1872).

1.



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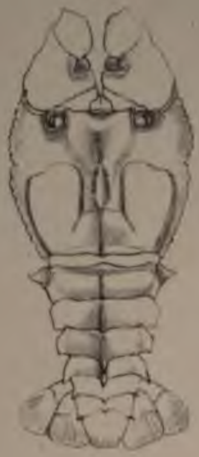

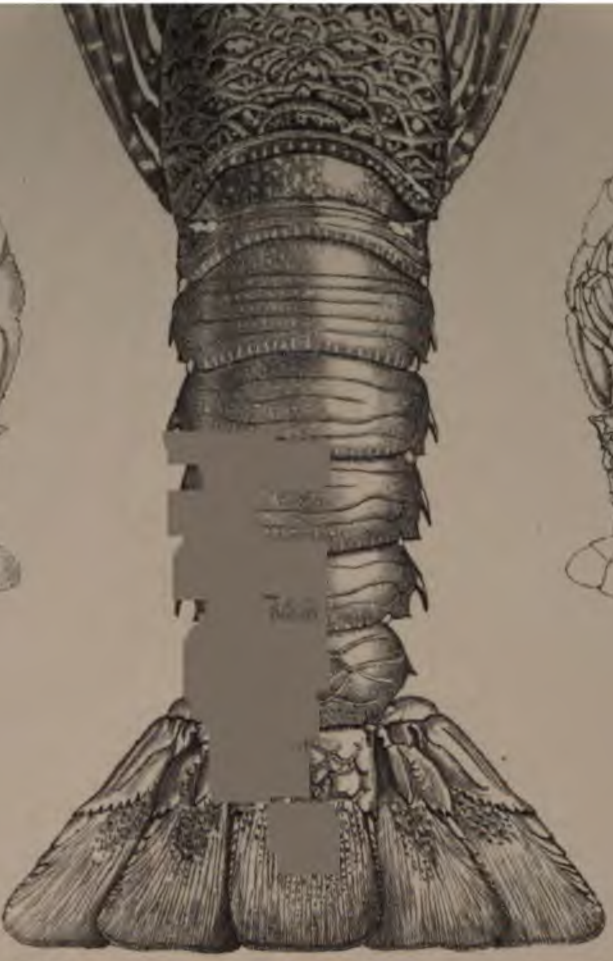

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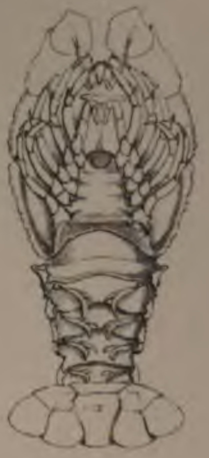

Edwin Wilson del. et lith.

Mintern Bros. imp.

Fig. 1. PALINURUS LONGIMANUS *var.* MAURITIANUS. Figs. 2. 3. PSEUDIBACUS PFEFFERI.

the figure showed distinct differences in the proportions of the penultimate joints and dactyli of the chelipedes, and in the coloration of the ambulatory legs, and as Milne-Edwards in his later diagnosis mentioned the existence of seven series of spines on the carapace, a character scarcely applicable to the specimen from the Mauritius, and also on account of the widely separated habitats of the two forms, I was at first inclined to regard the species as distinct. Before, however, applying a new specific name to the specimen from the Mauritius, I submitted a sketch of the chelipede and cephalothorax to Prof. A. Milne-Edwards, who very kindly compared them with the type of *P. longimanus* in the Paris collection, and sent me the following observations, with an outline drawing of the Paris type:—

"Le *Palinurus longimanus* (M.-Edwards) ressemble beaucoup à l'espèce qui a été trouvée au voisinage de l'île Maurice et dont vous m'envoyez un croquis. Il y a cependant quelques légères différences dans la disposition des épines. Vous pouvez en juger par le dessin où j'ai figuré la carapace du *P. longimanus* type de notre collection. En arrière de l'épine latérale postorbitaire il s'en trouve une seconde qui me paraît manquer sur l'exemplaire de Maurice. Le doigt de la main du *Palinurus* du Muséum de Paris est moins courbé, mais la forme du membre est bien la même. Ce sont, comme vous voyez, de bien petits différences."

These remarks and the figures so courteously sent leave no doubt in my mind as to the specific identity of the two forms. The spine behind the lateral postorbital spine, which was not represented in the sketch sent to M. Milne-Edwards, is distinctly developed on one (the left) side only of the Mauritius specimen, where, however, it is very small.

As no sufficient description or accurate figure has as yet appeared of this *Palinurus*, which is certainly one of the most remarkable described, those which are now given will not be without interest; and the minor distinctions referred to below will, I think, justify me in considering the Mauritius specimen as belonging to a distinct variety —the more so as this is, I believe, the first recorded instance of a Crustacean from the Mascarene subregion being specifically identical with one from the West Indies, unless, indeed, certain species having an almost cosmopolitan distribution are to be excepted. This, moreover, is in itself a fact of much interest on account of the well-known affinities that exist between the Mascarene and South-American faunas.

Whether *P. longimanus* is to be regarded as an instance of a once widely-spread species surviving to the present period in these widely distant and isolated localities, or whether further researches will demonstrate its existence at Cape Verd or on the western coast of Africa (whence it may have passed round the Cape of Good Hope into the Oriental region), time only will show. Certain it is that it differs widely from the typical *Palinuri* in the remarkable development and dilated palms of the anterior legs, which may be taken by some zoologists as indicative of an affinity with the Astacina.

Palinurus longimanus, var. mauritianus, n. (Plate XXXVI. fig. 1.)

The carapace is of the form usual in *Palinurus*, with the cervical suture very distinctly defined, and is everywhere covered with flattened tubercles whose anterior margins are bordered with a fringe of *setæ*: the tubercles are smaller upon the hepatic and antennal regions; the median rostral spine is small and narrow-acuminate; on either side of it are two spines, and behind it, in a median longitudinal series, are three other small spines, of which the second is the largest; the supraocular spines are very large, the upper margin of each is armed with two smaller spines, the lower margin is entire; behind each of the supraocular spines, on the gastric region of the carapace, are three spines in a longitudinal series; below these are placed three spines on the hepatic region; there is a strong spine, followed by a second much smaller spine, on the antennal region of the carapace below the eyes; about eight spines are placed in a transverse series along the front of the cardiac and branchial regions, immediately behind the cervical suture. The segments of the postabdomen are without spines or tubercles (except the lateral and marginal spines), and are marked with transverse linear sutures, which are often interrupted, and vary in number and disposition on the several segments; their arrangement will be best understood by a reference to the figure; the lateral lobes in the first to sixth segments terminate in a strong spine, which, in the second to fifth segments, is long and curved backward, and is followed by a small spinule on the rounded postero-lateral margins. On the sternal surface of the body, on those segments with which the second to fourth legs are articulated, a prominence bearing two spines or tubercles is situated on each side of the middle line of the body; the last sternal segment is armed with a strong spine on each side of the middle line of the body and one near the bases of the fifth legs; the inferior surface of the first postabdominal segment is armed with about six spinules, the second to fifth segments with two, and the sixth segment with three spinules. The eye-peduncles are of moderate thickness; the eyes (with thei corneæ) are very large and subspherical; the median portion of th ophthalmic segment is visible in a dorsal view, as in the typic *Palinuri*; and in form the antennulary segment with its stridu lating apparatus, and the antennules and antennæ, do not essen tially differ from the same parts in *P. vulgaris*; the flap of the stri dulating apparatus is indurated: the antepenultimate joint of th peduncle of the antennules nearly reaches to the end of the peduncle of the antennæ. The antennæ are broken, but are considerably longe than the body; the joints of the peduncles are covered with flattene ciliated, squamiform prominences resembling those of the carapac and are armed with strong spines; the flagella have a line of longis hairs on their under surface. The left chelipede (the only one pre served) is very long and robust, more than half as long again as th first ambulatory legs; the merus has its upper margin compresse and subacute, armed with a spine at the distal end of its upp margin; behind it, and at some distance from one another, are tw smaller spines; the wrist has its upper margin subcarinated, with a spine at the distal end, behind which are several granules; the palm is nearly three times as long as broad, laterally somewhat compressed, with the upper and lower margins subacute—the upper armed with ten small tubercles and with a short spine placed above the base of the dactylus, which is much thickened at base and has its inner margin unarmed; except for a small tubercle at base, it curves downward nearly at right angles with the base against the small immobile finger, which is armed with two blunt teeth on its inner margin. The ambulatory legs are slender and smooth; the merus joints are armed below with a small distal spine, and are longitudinally canaliculated on their outer surface; traces of similar *canaliculi* are seen upon some of the following joints, and particularly of the dactyli, which are hairy. The distal portions of the terminal segment and uropoda are membranaceous and minutely spinulose as in the typical *Palinuri*, the margins of the indurated parts being denticulated nearly as in *P. vulgaris*.

The ground-colour of the carapace (in the dried example) is red, blotched or variegated with yellow; the postabdominal segments are orange-red, minutely punctulated with yellow; and the first to fifth segments have a transverse series of large yellowish-white spots bordering their posterior margins and the margins of the lateral lobes and spines; the flagella of the antennæ are alternately banded with yellow and red; the ambulatory legs are orange-yellow, with numerous irregular yellowish-white spots. The length of the body is a little over 6 inches (152 mm.), of the left chelipede about 6⅓ inches (160 mm.), of the first ambulatory legs nearly 4¼ inches (108 mm.). The unique example being dried, and the parts not always fully extended, it is difficult to give the exact measurements.

A single adult male is in the collection (preserved dry).

The Mauritian variety is to be distinguished from the West-Indian type of *P. longimanus* (if Prof. A. Milne-Edwards's outline drawings may be referred to for these minute details) only by the minute or obsolete second lateral postocular spine, the stouter leg of the first pair with more robust palm and stronger abruptly-curved dactylus, by the much greater development of the spines of the peduncular joints of the antennæ, and the existence of a spinule behind the long lateral spines of the second to fifth postabdominal segments—distinctions which, even if they exist, assuredly cannot be regarded as of specific importance.

Although *P. longimanus* differs so markedly from its congeners in the form and great development of the chelipedes, in what are usually regarded as the essential generic characters—*i. e.* in the distinct rostrum, the narrow antennal segment, approximated bases of the antennæ, and short antennulary flagella—it belongs, as already stated, to the typical *Palinuri*.

The genital apertures are situated upon a slender styliform prolongation of the coxal joints of the fifth ambulatory legs, which is directed inward toward the middle line of the sternum, and bears a small spine near the distal extremity. In *P. vulgaris* the rounded

prominences on which the genital apertures are placed are quit
and unarmed.

Reference should have been made in my previous pa
Mauritian Crustacea obtained by the British Museum fr
Robillard, to two species which were received from him last yea
of these is a fine and large specimen of an *Alpheus*, which I refe
what doubtfully to the *Alpheus rapax* of Fabricius, as describe
Haan. It has the rostrum prolonged backward as a median dorsa
to the middle of the carapace, and in other particulars agrees exc
well with De Haan's description[1], but differs from the fi
having the mobile finger of the larger chelipede vertically
than in that author's figure and subtruncated at its distal ext
The other species is an apparently undescribed species of *Pseud*
Guérin-Méneville, a genus previously unrepresented in the co
of the British Museum.

Pseudibacus pfefferi, sp. n. (Plate XXXVI. figs. 2,
The carapace is broader than long; the ambulatory legs a
cealed beneath its lateral prolongations. The upper surface
carapace is nearly smooth; the antero-lateral margins are thin
and regularly crenulated on each side; a notch marks appare
line of demarcation between the cervical and postcervical regi
front of the lateral notches are seven or eight, and behind them e
twelve crenulations; a longitudinal depression exists on each b
region, not far from the lateral margins. The median dorsal
the carapace is marked by a longitudinal ridge or keel, whic
nates at a short distance behind the anterior margin, and
cardiac region is bifurcated—the two carinæ thus formed e
a median depression or shallow pit, behind which they reu
are continued as a simple ridge to the posterior margin of t
pace; the anterior and the two median carinæ are each divi
three or four obscurely indicated lobes; the posterior carina i
but terminates in a small tubercle on the posterior margin
carapace. The anterior margin of the front is bisinuate
median portion, where the basal lobe of the rostrum is art
with it; the terminal plate of the rostrum is transverse, w
extremity subacute, and is divided through about half its le
a median, longitudinal, nearly closed fissure. The orbits are
about midway between the median line and the lateral angle
carapace, and are merely closed by a process of the basal
joint as in *Pseudibacus gerstaeckeri*. The postabdomen r
that of *P. gerstaeckeri* as described by Dr. Pfeffer in all
characters: thus the second to fifth segments are each arm
a median dorsal carina, which slopes obliquely downward
anterior margin (except on the second segment), and is po
produced and ends in an acute tooth on the fourth and fifth se
the sixth segment has a small median tubercle on its posteri
gin, and the seventh three at the line of demarcation bet

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[1] *Vide* Crustacea, in Siebold's 'Fauna Japonica,' p. 177, pl. lxv. fig.

chitinous and membranaceous portions of this segment, situate one in the median line and one on each lateral margin; the lateral margins of the second to sixth postabdominal segments are divided into several somewhat triangulate lobes or teeth. The eyes are short, and in a dorsal view are completely contained within the orbits; the antennules are short, and terminate in two flagella, whereof one is much thicker than the other. The large leaf-like external processes of the antepenultimate joints of the antennæ terminate in a small spine at their antero-external angles, behind which are two teeth on their outer margins, and have a small tuberculiform tooth on their inner margins; the terminal antennal joints are somewhat obtusely angulated at the distal extremity, and have their margins minutely crenulated or serrated; the outer maxillipedes are small, with the ischium as long as the merus joints. The legs are short, concealed beneath the carapace, with the margins of the joints angulated; the dactyli of all are strong, slightly curved and acute; the antepenultimate joints have a short spine at the distal ends of their upper margins; the coxal joints of the fifth legs bear a strong spine.

Colour (of dried *exuviæ*) reddish-yellow, with darker reddish markings on the sides of the branchial regions of the carapace and of the postabdomen, on the inner margins of the antepenultimate joints of the antennæ and of the legs. Length of the body about 1 inch 3 lines (32 mm.), greatest breadth about 8½ lines (18 mm.).

Three cast shells are in the collection.

From the Mediterranean *Pseudibacus veranyi*, Guérin[1], this species is distinguished by the very different tuberculation of the carapace, and the emargination of its lateral margins, the closed median fissure of the rostrum, &c. These characters will also suffice to distinguish our species from the Californian form described by Prof. S. I. Smith[2] as ***Evibacus princeps***, but which I think can scarcely be generically distinct from *Pseudibacus*. *P. pfefferi* is most nearly allied to an Atlantic species described by Dr. G. Pfeffer in his memoir already referred to[3] as *Pseudibacus gerstaeckeri*, which, however (as it would appear from the description), has the carinæ of the carapace differently disposed, and has no median depression on the cardiac region, but in place thereof a continuous median keel; moreover no mention is made of any spines at the distal ends of the antepenultimate joints of the ambulatory legs. I must therefore consider our species distinct from *P. gerstaeckeri*; and I have much pleasure in associating with it the name of the author of that important memoir, which is of much value to the student of the classification of this group.

EXPLANATION OF PLATE XXXVI.

Fig. 1. *Palinurus longimanus*, var. *mauritianus* (p. 540) male adult, nat. size.
2. *Pseudibacus pfefferi*, p. 542, × 1½ diam.
3. Inferior view of the same, × 1½ diam.

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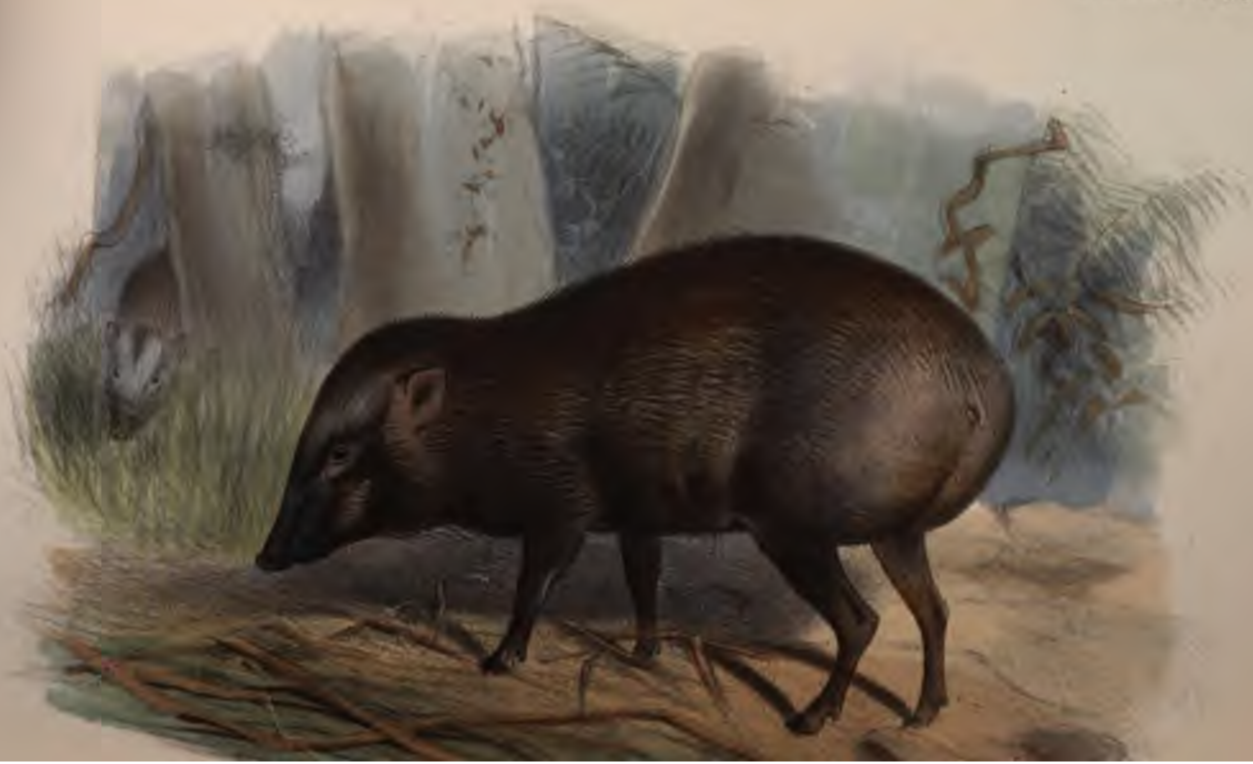
[1] Rev. et Mag. de Zoologie, vii. pp. 139, 140, pl. v. (1855).
[2] Amer. Journ. Sci. and Arts, xlii. p. 118 (1866).
[3] Verhandl. naturwissensch. Vereins Hamburg-Altona, p. 51 (1881).

P.Z.S.1882.Pl.XXXVII.



fed; and after the knocking about those which I have sold to this Society have stood, these animals must be called any thing but delicate.

"There is great difficulty in catching the Pygmy Hog. Some five years ago a young one was secured by a Mr. Fischer, who tamed it; but it afterwards escaped. I have heard of no other individual being possessed by any one but myself.

"The Calcutta Zoological Society were trying for years to obtain a pair, but were unsuccessful in getting a single example until those which they received from the Maharajah of Cooch Behar through me (as already mentioned) reached them.

"It has taken me about four years to get the four now procured. They were caught in snares, which were set in hundreds all over the country throughout a range of about twenty miles. If you require more I may be able to get some when I return to India in about two months' time."

Mr. Sclater exhibited a drawing of this animal by Mr. Smit (Plate XXXVII.), and remarked that Mr. Carew's four specimens were apparently in excellent health, and fed well on boiled vegetables, rice, potatoes, and other food usual for such animals. On measuring the largest and the smallest, the length of the body had been found in the one case to be 17 inches and in the other 14 inches. The weight of the largest animals had been ascertained to be about 10½ lb., and of the smallest 9¼ lb. Alluding to the rarity of the animal, Sir Joseph Fayrer had stated that during the many years in which he had hunted in the Terai he had never succeeded in obtaining a single specimen.

2. A Mediterranean Seal (*Monachus albiventer*), presented by M. Yeates Brown, Esq., H.B.M. Consul at Genoa, May 18th. This Seal, the first example of the species that had been received at the Gardens, had unfortunately not long survived its arrival.

3. Two male Argus Pheasants (*Argus giganteus*), presented to the Society by Major M'Nair, C.M.G., and J. M. Vermont, Esq., May 18th. This arrival was especially acceptable, as we had previously only two unmated females of this magnificent bird in the Collection.

4. A Koala (*Phascolarctos cinereus*), purchased May 23.

It is of great interest to receive a second example of this delicate animal, the only former specimen of which lived about fourteen months in the Society's Menagerie (see P. Z. S. 1880, p. 355, and 1881, p. 180), and to be able to announce that it seems likely to thrive. It feeds itself on the leaves of a large gum-tree (*Eucalyptus globulus*) which has been introduced into its cage, and also eats a little bread and milk.

5. A Jackass Penguin (*Spheniscus magellanicus*) from the Falkland Islands, purchased May 25. This is an adult bird in fine plumage, and is the first example of this species of Penguin that we have as yet received.

6. A fine pair of Great Ant-eaters, *Myrmecophaga jubata*, purchased May 31.

Mr. Sclater also exhibited some Lepidopterous and other Ins
which had been recently reared at the Insect-House in the Societ
Gardens under the care of Mr. A. Thomson.

The following is a list of the species exhibited :—

Attacus mylitta.
—— cynthia.
Samia cecropia.

Cricula trifenestrata.

Deilephila euphorbiæ.
Trochilium apiforme.
—— melanocephalum.

Sciapteron tabaniforme.
Sesia scoliiformis.
—— formiciformis.
—— conopiformis.
—— musciformis.
—— spheciformis.

Argynnis paphia.
Lycæna iolas.

Mr. W. A. Forbes exhibited preparations showing the rudiment
hallux of several birds commonly described as three-toed, and m
the following remarks :—

“Whilst engaged in working out my ‘Report on the Anatomy
the Petrels’ for the ‘Voyage of H.M.S. Challenger,’ I happe
to come across Dr. Kidder’s note[1] on the existence of a rudiment
external hallux in *Phœbetria fuliginosa*, a bird hitherto suppos
like other Albatrosses, to lack the hind toe altogether. Finding,
an examination of my specimen, his remarks correct, I proceeded
examine examples of three other species of Albatrosses that I had in
flesh, namely *Diomedea exulans*, *D. brachyura*, and *Thalassiarche c*
minata. In all of these I discovered a hallux present, though in a m
rudimentary condition, consisting of a single small nodule of bo
which lies altogether underneath the skin, in the fibrous subcutane
tissues, and only appears externally as a minute pimple-like elevati
with *no* claw. In *Phœbetria* there is a minute claw visible external
whilst internally *two* small bony nodules are discernible, represent
undoubtedly the metatarsal element and the hallux, which, as in
other Tubinares, is reduced to a single phalanx. It is difficult
present to say whether the single nodule of the other Albatros
represents these two elements fused together, or only one of the
in the latter case it is probably the phalanx itself that is wanting

“The discovery of the rudimentary hallux in the Diomedeinæ l
led to finding a similar one in some other birds usually considered
be three-toed, namely the Woodpeckers of the genera *Picoïdes* a
Tiga. In these the hallux consists of its normal number of phalanges
minute size, as is also the metatarsal. The “great toe” thus formed l
completely under the skin, and is only discernible on reflecting t
integuments carefully, when the chain of minute ossicles, connect
to each other and to the tarso-metatarse by fibrous tissue, appear

“These facts render it not improbable that a similarly reduc
hallux may really exist in many birds commonly described as thr

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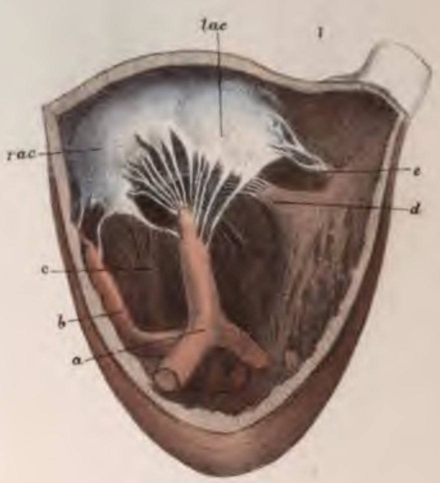
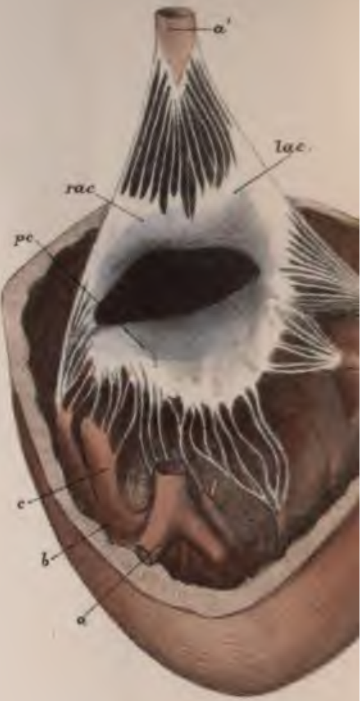
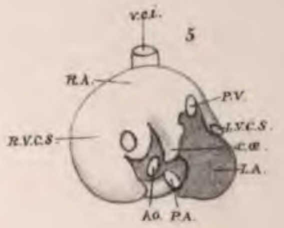
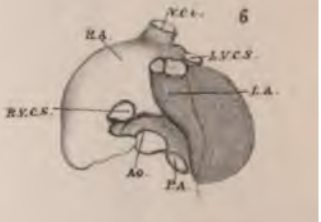
[1] Bull. U.S. Nat. Mus. i. p. 22.

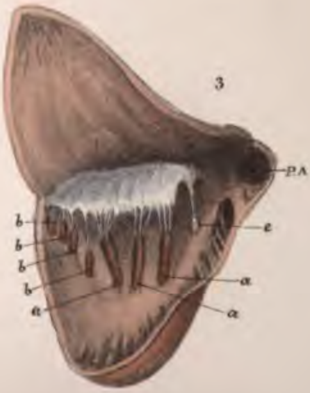
[2] *Cf.* Voyage of H.M.S. ‘Challenger:’ Report on the Anatomy of the Petr
pp. 13, 14.

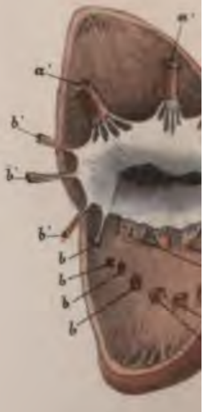








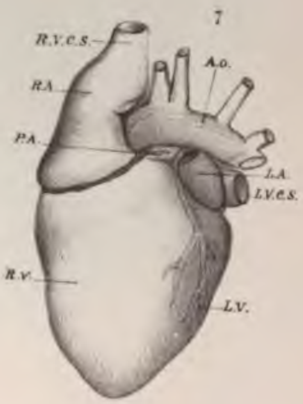




J. Smit lith.

EART-VALVES, OF MAN AND RABBIT.

7



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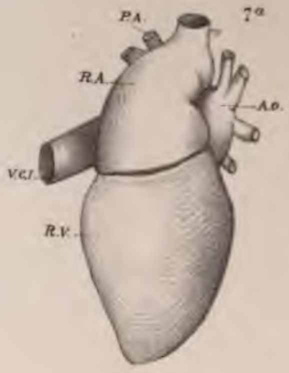

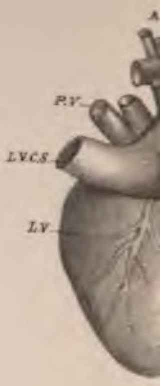

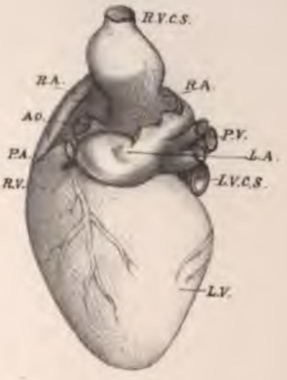

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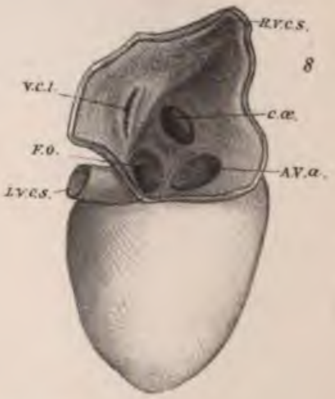

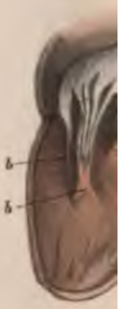

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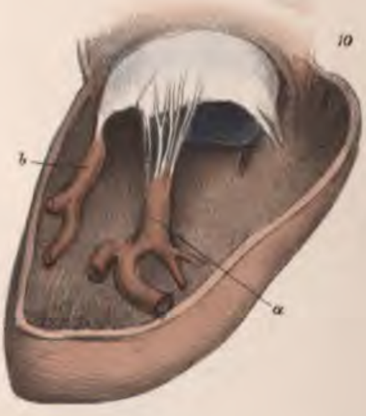
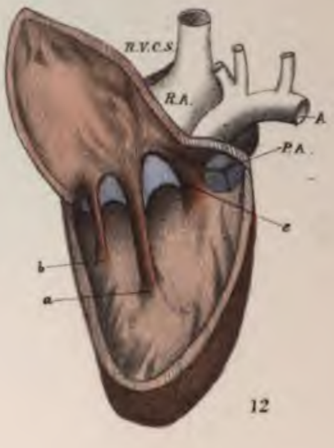


J Smit lith.

HEART-VALVES, OF ORNITHORHYNCHUS.



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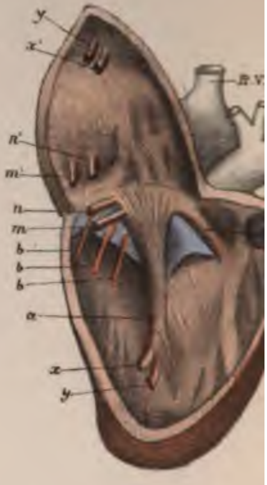

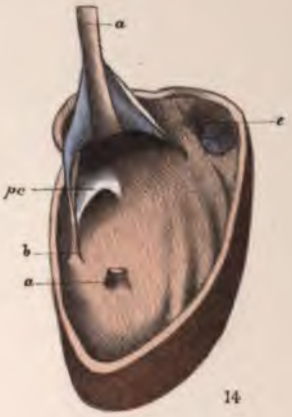

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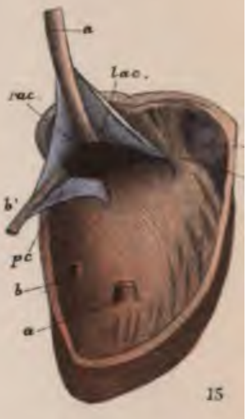

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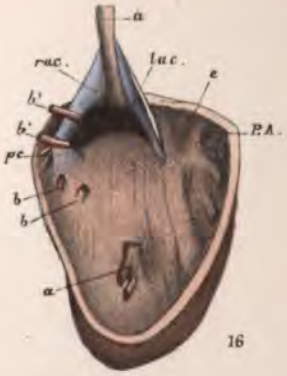

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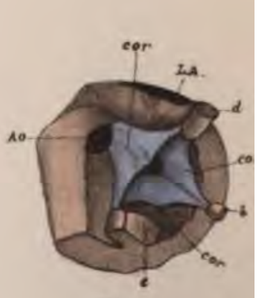

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J. Smit lith.

HEART-VALVES, OF ORNITHORHYNCHUS.

obvertitur et insidet margine fixo. Recte a Cuvierio maxima ex parte carnea dicitur, quum nonnisi pars libera, anterior, margine leviter concavo circumscripta, membranacea sit. Fasciculi musculares, ad ipsam et e septo et e pariete antico tendentes ad tres ordines reduci possunt. Inferior, major, e pluribus fasciculis componitur ex septo medio infero ad extremum valvulæ inferius abit, anterior ex parietis anterioris parte inferiore recte ad basin valvulæ ascendit, ubi cum superiore, ex summitate septi descendente confluit."

Owen, in the article Monotremata in Todd's Cyclopædia, vol. iii. p. 390, describes the valve somewhat differently. He distinguishes two fleshy and two membranous portions—the smaller of the latter, placed near the base of the pulmonary artery, agreeing according to him with the smaller muscular fold of the Cursores, whilst the second larger fleshy mass is homologous with the chief muscular valve of the Bird's heart.

Gegenbaur ("Zur vergleichenden Anatomie des Herzens," Jenaische Zeitschrift, 1866, vol. ii. p. 381) objects to this identification, although he practically admits something very much like it in comparing the valve of *Ornithorhynchus* to that of the Crocodile, which, in its turn, may be readily shown to have common features with that of the Bird. In his 'Elements of Comparative Anatomy,' English edition, p. 584, Gegenbaur speaks of the fleshy structure of the heart of *Ornithorhynchus* as being a retention in this animal of a condition which is not unknown in other Mammalia, but is transient in them, being found at an early period of development.

In his memoir in the 'Jenaische Zeitschrift,' Gegenbaur gives an original description of the right auriculo-ventricular valve of *Ornithorhynchus*, but no figure of it. His description does not agree with that of his predecessors, nor with what I have observed. He says:—"I find the entire circumference of the right atrio-ventricular ostium beset by a membranous valve, which has developed muscular bundles only at certain parts, and is disposed, as the following account shows, somewhat otherwise than Meckel and Owen have stated. Two portions may be distinguished in this valve —a part adjacent to the ventricular septum, and a part which fringes the ostium along the outer wall of the ventricle. The two portions posteriorly pass into one another, and anteriorly, in the neighbourhood of the origin of the pulmonary artery (that is, at the conus arteriosus), are separated from one another, inasmuch as here a spot is found in the circumference of the ostium in which the valve is interrupted." [This does not accord with the previous statement as to the "entire" circumference being beset with the valve. As will be seen below, in the hearts examined by me a very large part of the circumference of the ostium is devoid of any valve.] "The portion of the valve corresponding to the outer ventricular wall begins broadly at the conus arteriosus (or anteriorly); it stretches outwards and backwards, becoming broader, and then narrows again and passes into the median division of the valve. At the anterior point of fixation of the valve, two strong muscular bundles pass from the ventricular septum into the valve, and run (the heart being supposed to have its toed. On the other hand, I have been quite unable to detect even a trace of it in some such birds, as *e. g. Rhea, Tetrax*, and *Pelecanoïdes*."

Prof. Owen, C.B., F.R.S., F.Z.S., read the twenty-fourth of his series of memoirs on the extinct birds of the genus *Dinornis* and their allies. The present memoir contained the description of the head and two feet with the dried integuments attached, of an individual of a species of *Dinornis*, proposed to be called *D. didinus*, which had been recently obtained from a cavern or fissure near Queenstown, in the South Island of New Zealand.

This memoir will be printed entire in the Society's 'Transactions.'

The following papers were read:—

1. On the Valves of the Heart of *Ornithorhynchus paradoxus* compared with those of Man and the Rabbit, with some Observations on the Fossa Ovalis. By E. RAY LANKESTER, M.A., F.R.S., Jodrell Professor of Zoology in University College, London[1].

[Received May 30, 1882.]

(Plates XXXVIII.-XLI.)

The statement current in text-books of Comparative Anatomy to the effect that in *Ornithorhynchus paradoxus* the right auriculo-ventricular valve is "fleshy," and therefore in some degree similar to that of Reptiles and Birds and different from that of other Mammalia, appears to rest chiefly upon the statements and figures of Meckel, published in his Monograph of the Anatomy of the Duck-bill, though Cuvier, Owen, and Gegenbaur have also made observations on the subject. No anatomist appears to have published any drawing of the heart of *Ornithorhynchus* since Meckel in 1828; and no figure has ever been given of the interesting points of structure presented by that heart which is in any sense adequate. The figure of the opened heart given by Meckel, and intended to show the fleshy auriculo-ventricular valve, is simply unintelligible owing to the absence of both shading and colour.

Meckel describes the right auriculo-ventricular valve in these words:—"Ostium venosum valvulâ clauditur simplici, semilunari. Cuvierus eam nonnisi concavo ventriculi pariete respondere dicens, minus perspicue loqui videtur, quum uterque, et anterior s. dexter, et posterior s. sinister, a septo formatus, convexi sint. Ille revera

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[1] I am indebted to Mr. J. J. Quelch, B.Sc., lately my assistant, and now one of the staff of the British Museum, for aid in making the drawings and dissections upon which this memoir is based.

characteristically forms the right auriculo-ventricular valve in other Mammals, I have taken an opportunity of carefully examining and drawing the valves and some other structural features seen in the hearts of two specimens of *Ornithorhynchus* presented to me by my friend Professor Liversidge, of Sydney, Australia.

The main object of the present communication is to publish satisfactory illustrations, with explanatory description, of the appearances presented by these two hearts. I cannot doubt that both anthropotomists and zoologists will be glad to possess something like a sufficient record of the very important facts observable in the heart of *Ornithorhynchus*; and I have added for comparison drawings of identical dissections viewed in corresponding positions of the "standard" heart (that of Man) and of the heart of the Rabbit, which, curiously enough, differs more from that of Man in respect of the structure of its right auriculo-venticular valve than does that of the sheep, the ox, the dog, the hedgehog, the great ant-eater, the wombat, and the koala, which I have examined with especial reference to this point, and some of which are illustrated in the plates.

For several interesting hearts I am indebted to the kindness of Mr. W. A. Forbes, Prosector to the Society.

I shall first describe the figures accompanying this paper which illustrate the comparative structure of the right auriculo-ventricular valve of Man, the Rabbit, and *Ornithorhynchus*; I shall then describe the left auriculo-ventricular valve of *Ornithorhynchus*; and finally point out some peculiarities in the structure of the auricles of the heart of that animal, which have led to the erroneous statement that it possesses a deeply marked "fossa ovalis."

THE RIGHT AURICULO-VENTRICULAR VALVE.

A. OF MAN.—From the tendinous margin of the right auriculo-ventricular orifice of the human heart depends into the ventricle a complete and continuous membranous collar (Pl. XXXVIII. figs. 1 & 2). This is the so-called tricuspid valve. It derives its name from the fact that, although forming one continuous collar-like ring, the membrane is produced at three points, forming three cusps or flaps.

Two of these cusps are anterior in position, and may be called right and left anterior cusps[1] (*r a c*, *l a c* in the figures). The third is wider than the two anterior, and rests against the septum or wall separating right from left ventricle; it may be called the posterior or septal cusp (*p c*).

The three cusps of the tricuspid valve of Man are attached by fine chords (the "chordæ tendineæ") to definite muscular lobes (the "musculi papillares") projecting from the ventricular wall, and also by some of the chordæ directly to the ventricular wall.

The two anterior cusps of the valve are in relation with the largest muscular lobe or musculus papillaris, which springs from the septal surface near the apex of the ventricular chamber (fig. 1, *a*). The long axis of this lobe would, if produced, pass between the two anterior cusps in the notch which separates them. Right and left two groups, each of four or more chordæ tendineæ, pass from the free end of this papillary muscle, and, spreading out fan-wise, join respectively the right and the left cusps of the membranous valve; so that the adjacent margins of the two cusps are connected by groups of chordæ to the papillary muscle; and were the groups of chordæ to be enlarged and fuse with one another, we should have in place of a right and a left anterior cusp one large anterior cusp connected by the most prominent portion of its border to the papillary muscle. This hypothetical condition is realized in *Ornithorhynchus*.

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[1] The "inferior" and "anterior" of human anatomists. In the present memoir the apex of the heart is regarded as inferior, the base as superior, the dorsal surface as posterior, the ventral surface as anterior.

The large papillary muscle thus related in Man to the right and left anterior cusps of the tricuspid valve, is the "great" or "anterior" papillary muscle.

The right border or curvature of the right anterior cusp is connected by chordæ tendineæ to a small papillary muscle, which may be called the "right papillary muscle" (figs. 1 & 2, *b*).

The left border or curvature of the left anterior cusp is connected by chordæ directly to the wall of the ventricle, to the right of that region which is known as the pulmonary cone (figs. 1 & 2, *e*).

The septal cusp or segment of the tricuspid valve of Man may be regarded as really the posterior equivalent of both anterior cusps, not divided or produced into two pieces. It is connected to the septal wall of the ventricle directly by chordæ tendineæ, and also to two small papillary muscles which project from that wall (fig. 2, *c*, *d*), and may be known as the posterior or septal papillary muscles (greater and less). These are smaller than the right papillary muscle; and all the other papillary muscles are much smaller than the "great" or "anterior" papillary muscle.

B. Of the Rabbit.—Whilst a large number of mammals possess a tricuspid valve very closely similar in its arrangements to that of Man (see Pl. XLI. figs. 18–22), in the Rabbit (Pl. XXXVIII. figs. 3, 4) a considerable divergence from the human standard occurs.

The valve of the right side of the Rabbit's heart cannot be described as "tricuspid" in any sense. It is a continuous membranous collar connected by numerous chordæ tendineæ to two rows of musculi papillares. The valvular collar is elliptical in form; and it may be divided into an anterior and a posterior (or septal) portion corresponding to the two long sides of the ellipse.

The two rows of musculi papillares are arranged along the septal portion of the ventricular wall as a superior and an inferior series. The superior series are connected by chordæ tendineæ with the posterior or septal half of the valve; the inferior series are connected by chordæ with the anterior half of the valve.

There are seven musculi papillares in the inferior series belonging to the anterior part of the valve[1]. Those of the superior series, belong-

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[1] Since the above was written I have found that great variations occur in the points described in individual Rabbits. Often the musculi papillares are not more than three in number, as in the figure of a Rat's ventricle (Plate XXXIX. fig. 11).

ing to the septal part of the valve, are smaller in size, and in pass
from left to right dwindle, so that at the right of the middle line
chordæ are inserted directly into the ventricular wall and not i
papillary eminences. Only three distinct papillary eminences
be distinguished in this series.

Comparing this arrangement with that found in Man, it is obvi
that the seven papillary muscles of the anterior part of the valve
respond to the "great" and the "right" anterior papillary muscle
Man; whilst the superior series connected with the septal part of
valve correspond to the posterior papillary muscles of Man. But in
Rabbit not only must we consider that the "great" and the "rig
papillary muscles are divided and represented each by three sepa
papillary muscles, but also that the attachment of chordæ spring
from the extreme left of the left anterior cusp and from the left
the septal cusp in the human heart, are in the Rabbit attached
small papillary elevations of muscular substance, instead of be
attached simply to the unraised surface of the ventricular wall.

It is an interesting question as to whether the condition found
Man and in most mammals is more primitive than that found in
Rabbit. The fact that the Rodents are lower forms than
Simiæ might lead us to regard the condition seen in the Rabbit
more primitive; but the very general conformity of the other Ma
malia (including such Marsupials and Edentata as have been examin
to the arrangement found in Man, leads to the supposition that
Rabbit's right cardiac valve is a specialization departing from
earlier type preserved in Man.

This conclusion will be found to be confirmed by the facts wh
we now shall expose in reference to the right cardiac valve of *Ornit*
rhynchus.

C. OF ORNITHORHYNCHUS PARADOXUS.—The right auric
ventricular valve of *Ornithorhynchus* is drawn in two sets of figu
accompanying this paper (Plates XXXIX., XL.), taken from
two female specimens in an excellent state of preservation mentio
above. In both of them the membranous collar which forms
complete valve in other Mammalia is seen to be incompletely
veloped, and not "entire" as stated by Gegenbaur. Instead of
elliptical auriculo-ventricular orifice being completely fringed by
more or less deeply dependent valve, we find only its anterior mar
and a small portion of its posterior or septal margin (the extr
right) thus fringed. The septal or posterior portion of the v
is, in fact, almost entirely wanting in one of my specimens (fig.
This result of my observations is diametrically in opposition to
statements of Gegenbaur quoted at the commencement of this mem

The absence of the greater part, or even the whole, of the se
flap at once constitutes a very important difference between the ri
cardiac valve of *Ornithorhynchus* and that of any other Mam
which is known.

Anterior flap.—The well-developed anterior portion of the memb
nous valve is triangular in form, and is connected with a very large m
cular column, which for convenience may be spoken of as muscu

papillaris, although not "papillary" (figs. 12 & 13, *a*). It obviously corresponds to the great or anterior papillary muscle of the human heart. The vertex of the triangle formed by the membranous flap of the valve is bisected by this great papillary muscle, which widens out as it passes upwards, and is inserted into the anterior border of the auriculo-ventricular ring, thus dividing the membranous triangular flap into two distinct pieces, a right and a left. It is therefore perhaps not quite correct to speak of these two segments united by the muscular band as *one* anterior flap: the flap might perhaps be regarded as composed of *two* membranous segments united by a median muscular band which is the prolonged anterior papillary muscle. The membranous substance of the valve, however, is distinctly continued beneath or on the lumen side of the muscular band, thus uniting the two halves, which at first sight seem to be separated by the muscular substance. Obviously the right segment corresponds to the right anterior cusp, and the left segment to the left anterior cusp, of the human tricuspid valve.

The peculiarity of this region in *Ornithorhynchus* consists in the fact that there are no chordæ tendineæ connecting the membranous segments to the great papillary muscle, while the muscle itself is attached directly to the membranous flap, and is continued through it up to the auriculo-ventricular ring, so as to invade (over a broad band-like area) the membrane of the valve by muscular tissue.

There is also a complete absence of chordæ tendineæ from the left border of the left anterior flap, which is, in their absence, directly attached to a fleshy arch which extends from the side of the pulmonary cone up to the auriculo-ventricular ring, where it is confluent with the expanded insertion of the great papillary muscle (figs. 12, 13, 14, 15, *e*). Consequently the left membranous segment of the valve is triangular in shape, the free border forming the base of an isosceles triangle.

Both hearts examined agreed in the features so far described.

In regard to the connexions of the right membranous segment of the anterior portion of the valve, they differ a little from one another. In heart No. 1 (fig. 12) there is a well marked right papillary muscle (*b*) corresponding to the similarly placed muscle in Man, but differing from that of Man, just as does the great papillary muscle, in the fact that it is devoid of any chordæ tendineæ and is continued from the ventricular wall up to the auriculo-ventricular ring, having the right border of the right membranous cusp or segment attached directly to its left border in the upper part of its course.

Septal flap.—To the right or posterior border of this smaller muscular band in heart No. 1, one lateral border of the very small septal membranous flap is attached. This rudimentary posterior or septal flap arises along the posterior or septal margin of the auriculo-ventricular orifice for not more than one third of the extent of that margin, the rest being free from any valvular collar or fringe (figs. 14 & 15, *p c*).

The condition seen in heart No. 1 may be understood by supposing, in a valve arranged as in Man, the chordæ tendineæ to become muscular and compacted together and so to form parts of the

papillary muscles, which should then be continued right thro
the membranous collar of the valve to the auriculo-ventricular r
Further, we should have to suppose the suppression of the whol
the septal division of the valve and its related chordæ and mus
excepting a little piece in immediate relation with the right ant
papillary muscle.

The heart No. 2 (fig. 13) of *Ornithorhynchus* differs from N
in the fact that there is not a single right anterior papillary mu
but five separate muscular slips representing it, of which three (fig
b, *b*, *b*) are attached to and traverse the membranous substan
the valve, whilst two (*m*, *n*) pass over it and reach the auriculo-
tricular ring. These latter are of great importance in the compa
with the heart of Sauropsida, since they arise from the *ant*
ventricular wall. The heart No. 2 is also remarkable, as alr
mentioned, for the reduction of the septal portion of the membra
valve to a vanishing quantity (fig. 16 *p c*).

In both hearts the three muscles of the valve (or two and
subdivided third) become continuous with one another at their i
tion into the auriculo-ventricular ring. The large papillary m
in the middle spreads out on either side, and on the left complete
arch formed by the muscular lobe (*e*) rising from the side of the
monary cone; on the right it similarly completes an arch, of w
the right side is formed by the spreading insertion of the right p
lary muscle or its representative slips (figs. 12, 13).

It is thus quite clear that the description of the right auric
ventricular valve of *Ornithorhynchus* as "fleshy" is quite cor
membrane, though present, plays a subordinate part as comp
with what is seen in other Mammalia.

Not only this, but it seems probable, from the very impe
development of a septal or posterior flap to the valve, that the a
of the valve must differ importantly from that of the valve of
mammals, and resemble that of the fleshy valve of birds and rep

The reflux of blood into the auricle on contraction of the ven
is not prevented in *Ornithorhynchus* by a passive floating-o
membranous cusps, but, as in birds and reptiles, the muscular a
of the valve are by their active contraction pressed against the s
portion of the auriculo-ventricular orifice, which is for two thirc
sometimes more) of its extent devoid of any depending cusp or r
branous flap.

How far there is a real agreement, due to common inheri
from a common ancestor, between the muscular structures o
right cardiac valve of *Ornithorhynchus* and those of the sim
placed valve in birds and certain reptiles, is a distinct and
important question, into the discussion of which I do not pr
to enter on the present occasion.

THE LEFT AURICULO-VENTRICULAR VALVE.

The valve which is called "mitral" in Man's heart differs in s
ture in *Ornithorhynchus* from the human standard, although r
less so than does the right auriculo-ventricular valve.

The "mitral" valve of the Ornithorhynchus is in fact a "tricuspid" instead of a "bicuspid" valve. Its construction, so far as the relation of membrane to muscle is concerned, is similar to what is seen in Man's heart. There is no invasion of the membranous flaps by the fleshy substance of the musculi papillares as on the right side of the heart; at the same time the connexion of the musculi papillares with the membrane of the valvular flaps is *direct*, and not by the intervention of chordæ tendineæ.

In Man's mitral valve there are really *four* groups of chordæ which pass from the membrane to the heart's wall or to musculi papillares. A broad flap of membrane is developed between the anterior pair of these groups of chordæ, and, again, between the posterior pair, but *not* between adjacent anterior and posterior groups.

In *Ornithorhynchus* the attachment of the membrane to the muscle is by three equidistant points of the valvular membranous collar to three elevations of the muscular substance of the ventricle; and, as shown in the figure (fig. 17), the membrane is equally developed in each of the three spaces between the attachments. It is thus divisible into three areæ, each having the form of a truncated triangle. The valve is indeed more nearly comparable in shape to the aortic trisegmented semilunar valves than to the mitral of the human anatomists. A very distinct and important point of resemblance between the left auriculo-ventricular valve of *Ornithorhynchus* and the semilunar valves at the base of the great arteries, is the existence of a small knob of cartilaginous consistence at the centre of the free margin of each triangular portion of the valve. These appear to have the same significance as the corpuscles of Arantius in the semilunar valves.

THE AURICLES OF ORNITHORHYNCHUS.

Meckel has remarked on the large size of the right auricle of *Ornithorhynchus* as compared with that of the left. He has also stated that there is a very deep fossa ovalis. In these statements Owen is in accord with him. Gegenbaur does not discuss this subject when treating of the right auriculo-ventricular valve. I find that the right auricle is of unusually large proportions in *Ornithorhynchus* (figs. 5 & 6), and have compared in the drawings given the proportions in this animal with those presented by the Rabbit.

In fact the right auricle is much larger than has been hitherto supposed; for what Meckel and Owen have taken for a *fossa ovalis* appears *not* to be the representative of that structure, but an independent and special cæcum of the right auricle by which it encroaches upon the area occupied in other animals by the left auricle. The orifice of this cæcum, seen on opening the anterior wall of the right auricle, is very sharply defined and of the size which the fossa ovalis might be expected to present (Plate XXXIX. fig. 8, *Cæ*). It is not, however, in the position proper to the fossa ovalis. It leads into an extensive sac; and at first I was under the impression that the sac in question was a part of the *left* auricle, and hence that we had here a permanent communication between the

Fig. 9. Right auriculo-ventricular valve of *Phalangista*. *a*, *b*, anterior musculi papillares.

10. Ditto of *Phascolomys*. Letters as before.

11. Ditto of *Mus*. Letters as before.

Plate XL.

Fig. 12. Ornithorhynchus No. 1. Right ventricle opened and its anterior wall reflected so as to expose the valve.

a, great or anterior muscular column (musculus papillaris); *b*, right muscular column (musculus papillaris); *e*, left or "conus" muscular column; *P. A*, orifice of pulmonary artery; *R. A*, right auricle; *R. V. C. S*, right vena cava superior; *A*, aorta.

13. Ornithorhynchus No. 2. Similar dissection of a second specimen.

a, great or anterior muscular column; *b*, *b*, *b*, the three slips which represent the single column *b* of specimen No. 1; *m*, *n*, two additional muscular columns in the same region, which do not traverse the membranous part of the valve, but pass from the centre of the right muscular arch to the *anterior* wall of the ventricle, from connexion with which they have been cut, leaving the bases m', n'; *x*, *y*, "columnæ carneæ" connecting the base of the great muscular column with the anterior ventricular wall; x', y', the cut bases of the same; *e*, left muscular column; *P. A*, orifice of pulmonary artery.

14. Ornithorhynchus No. 1. The great anterior column cut and the valve reflected. Letters as in fig. 12.

15. Ornithorhynchus No. 1. Both the great and the right muscular columns are cut. Compare with the human heart, fig. 2.

Letters as in fig. 12, except *l a c*, left anterior portion of the membrane of the valve; *r a c*, right anterior portion of ditto; *p c*, posterior or septal portion of ditto.

16. Ornithorhynchus No. 2. The second heart (that of fig. 13) with its muscular columns cut and the valve reflected.

a, base of the great muscular column; a', its cut and reflected ostial portion; *b*, *b*, bases of two of the right small muscular columns; b', b', their cut ostial portions; *e*, left muscular column; *l a c*, left anterior portion of the membrane of the valve; *r a c* right anterior portion of ditto; *p c*, the very minute posterior or septal rudiment of ditto.

17. View of the left auriculo-ventricular valve of *Ornithorhynchus*. The apex of the ventricle has been cut away; and the observer is supposed to look upwards towards the aortic and auricular orifices. *e b d*, three muscular columns (papillary muscles) giving attachment to the valve; *cor*, corpuscles resembling the corpuscula Arantii, at the central point of the margin of each flap of the triradiate valve; *L. A*, left auricle; *Ao*, aortic orifice.

Plate XLI.

Fig 18. Right auriculo-ventricular valve of *Didelphys*. *a*, equivalent of the great anterior papillary muscle of Man; *b*, equivalents of the right anterior papillary muscle of Man.

19. Ditto of *Phascolarctos*.

20. Ditto of *Myrmecophaga*. *e*, as in fig. 1.

21. Ditto of *Erinaceus*.

22. Ditto of *Cuscus*.

2. On the Respiratory Organs of *Apteryx*. By THOMAS H. HUXLEY, F.R.S., F.Z.S.

[Received June 2, 1882.]

I am not aware that the structure of the respiratory organs o *Apteryx* has been investigated since the publication of Professo Owen's Memoirs on the Anatomy of the Southern Apteryx, in th second and third volumes of the 'Transactions' of this Society Professor Owen gives a detailed description of a structure which h terms the diaphragm, and compares it with that organ in mammals the account of the anatomy of the lungs and of the air-sacs, on th other hand, is less full. The important fact that no air-sac extend into the abdomen is noted; but only four air-sacs on each side ar mentioned, and no attempt is made to identify these with the air-sac of other birds.

The question whether *Apteryx* presents any real approximation t mammals in the structure of its breathing-apparatus is of consider able interest, from its bearing upon the general problem of th affinities of birds to other groups of vertebrated animals. Havin recently examined a specimen of *Apteryx* (which, although it ha been many years in spirit, was still in a very fair state of preserva tion) with reference to this point, I have come to the conclusion tha its respiratory organs differ in no essential respect from those c other birds—though they exhibit those peculiarities which ar peculiar to and characteristic of the class Aves in a less develope condition than that which obtains in all those Carinatæ and Ratita which have been carefully studied.

The admirable monograph by Sappey [1], chiefly based on the stud of the respiratory organs of the Duck, contains the most complete an accurate account extant of the general disposition of these organs i their highest condition of development. Rainey [2] supplemented thi by the important discovery of the existence of intercapillary air-pas sages; and, more recently, Campana [3] has contributed a very elaborat study of the respiratory organs of the Common Fowl. It is not diffi cult to verify the chief statements of these anatomists. Nevertheles it is any thing but easy to find a succinct and precise account of th facts; and the terminology at present employed appears to me to b for the most part cumbrous and inappropriate. I make no apology therefore, for endeavouring to amend this state of matters.

The lungs of birds lie, one on each side of the vertebral column between the first thoracic rib in front and the anterior end of th kidney behind. On the dorsal aspect they rise, on the sides of th vertebræ, as high as the tubercular transverse processes of the ribs On the ventral aspect they descend to a variable distance towards th ends of the vertebral ribs. The lowest point of the ventral margin lies on one of these ribs, not far from its articulation with the sternal rib; and the hinder part of this margin, or the *posterior ventral margin*, slopes upwards and backwards, while the *anterior ventral margin* is inclined upwards and forwards from this point, which may be called the *ventral angle* of the lung. The whole ventral margin of the lung is very thin; its dorsal margin, on the other hand, is thick and rounded off into the outer or lateral face of the lung, which is convex from above downwards. The dorsal margin and the lateral face are closely applied to the parietes; and the former presents deep notches, into which the necks and dorsal portions of the bodies of the ribs are received.

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[1] Recherches sur l'appareil respiratoire des Oiseaux: 1847.

[2] "On the minute Structure of the Lung of the Bird," Medico-Chirurgica Transactions, xxxii. 1849.

[3] Les lois de l'Evolution animale.—La respiration des Oiseaux: 1875.

The mesial face of the lung is divisible into three facets:—a *superior*, which is closely applied to the lateral faces of the vertebræ and to a fibrous lamella, the *median vertical septum*, which proceeds from the ventral faces of the vertebræ in the middle line; and an *anterior inferior* and a *posterior inferior* facet, which occupy that slightly concave face of the lung which is turned towards the thoracic cavity. These last facets are divided by a ridge or elevation of the surface of the lung, which ascends from the ventral angle to the insertion of the bronchus. This is always situated at some considerable distance from the anterior end of the lung.

The anterior inferior and posterior inferior facets of the lung are closely invested by a thin fibrous membrane, which may be termed the *pulmonary aponeurosis* ("diaphragme pulmonaire," Sappey; "diaphragmite antérieur," Milne-Edwards). The mesial edge of this is continuous with the median vertical septum; the lateral edge is inserted into the parietes of the thorax immediately beyond the ventral edge of the lung. Around the pneumatic apertures, or *ostia*, the pulmonary aponeurosis is closely adherent to their margins; it is, in fact, perforated by them.

Broad flat bands of striated muscle (the *costo-pulmonary muscles*) take their origin from the vertebral ribs[1], at some distance below the attachment of the pulmonary aponeurosis, and, proceeding obliquely dorsad and forwards, spread out and are inserted into that part of the aponeurosis which covers the posterior inferior facet. They are supplied with branches of the intercostal nerves. This pulmonary aponeurosis with its muscles is one of the two structures which have been compared to the mammalian diaphragm.

The second so-called "diaphragm" ("diaphragme thoraco-abdominal," Sappey; "diaphragmite thoraco-abdominal," Milne-Edwards) is a more or less aponeurotic fibrous membrane, continuous with the ventral edge of the median dorsal septum and suspended by it, like the roof of a tent, across the thoraco-abdominal cavity. In the middle line, this *oblique septum* slopes downwards and forwards to the dorsal and anterior face of the pericardium, with which its fibres become firmly connected on their way to their attachment to

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[1] In many birds there are additional "*sterno-pulmonary*" *muscles*, which proceed from the antero-lateral part of the sternum to the aponeurosis covering the anterior inferior facet.

the sternum. From the median line, the two halves of the obliqu
septum slope laterally and ventrally until they attach themselves t
the parietes of the abdomen behind, to those of the thorax mor
anteriorly, and to the margins of the sternum in front, at a con
siderable distance from the attachment of the pulmonary aponeurosi
It follows that a wide interspace is left, on each side, between th
pulmonary aponeurosis, dorsally and laterally, the dorsal media
septum in the middle line, the oblique septum ventrally and below
and the parietes of the body laterally; and, as the mesial attachment
of the pulmonary aponeurosis and of the oblique septum are ver
much closer together than their outer attachments, the whole cavit
has somewhat the form of a wedge with the narrow edge towar
the middle line. This ***subpulmonary chamber*** is divided into fou
loculi by three ***dissepiments***, which pass transversely from the later
face of the oblique septum to the mesial face of the pulmonar
aponeurosis. Each loculus lodges one of four ***postbronchial*** sac
cular diverticula of the wall of the lung, constituting the prop
air-sacs, which thus fill up the subpulmonary chamber, between th
insertion of the bronchus and its posterior extremity. Another ai
sac lies in front of the insertion of the bronchus, on the mesial side
the anterior extremity of the lung.

Thus, on each side, there are five air-sacs, the lateral and superio
face of each of which abuts against a particular region of the lung
The most anterior is that just mentioned, which may be called *pr*
bronchial ("réservoir cervical," Sappey), as the bronchus lies betwe
it and the next, or *subbronchial* ("interclavicular," Sappey). Th
dissepiment which separates the loculus of this sac from the next
attached mesially along the oblique elevation which runs from th
insertion of the bronchus to the ventral margin of the lung. Th
following dissepiment is attached dorsally, near the origin of th
cœliac artery from the aorta, which lies in the median dorsal septum
and thence to the pulmonary aponeurosis, along a line which is in
clined more or less obliquely backwards, to the posterior ventr
margin. It separates two loculi, which lodge the *anterior* and th
posterior intermediate air-sacs ("réservoir diaphragmatique antérie
et postérieur," Sappey). The third dissepiment, still more incline
divides the loculus of the posterior intermediate air-sac from that
the *posterior* air-sac ("réservoir abdominal," Sappey).

Thus, that part of the thoraco-abdominal cavity which lies dorsa
and anterior to the oblique septum lodges no other viscera than th
lungs and the air-sacs, and may therefore be distinguished, as th
respiratory cavity, from the *cardio-abdominal cavity*, which contai
the heart and the rest of the viscera, and lies below and behind th
oblique septum. The respiratory cavity is further divided into tw
lateral chambers by the median dorsal septum; and each of the
chambers is subdivided by the pulmonary aponeurosis into tw
stories, of which the upper is occupied by the lung, and the low
by the loculi with their contained air-sacs.

The dorsal aorta traverses the median dorsal septum from befo
backwards, giving off, from its ventral aspect, the cœliac and th

mesenteric arteries, which thus appear in the middle line of the oblique septum when this is viewed from below and behind. The vena cava inferior enters the pericardium just behind the attachment of the oblique septum to it.

Immediately after the bronchus has entered the lung, it enlarges somewhat to form a dilatation, which has been termed the *vestibule*. A trunk which continues the direction of the bronchus through the centre of the parenchyma of the lung backwards, leaves the posterior end of the vestibule, and ends at the superior end of the posterior ventral margin in the *posterior ostium*, by which it opens into the posterior air-sac. This trunk may be termed the *mesobronchium*, by way of distinction from certain others which have a superficial position on either the lateral or the mesial face of the lung; and which may be distinguished, respectively, as *ecto-* and *ento-bronchia*.

Toward the middle of its course the mesobronchium gives off a wide branch, which passes backwards and downwards to the posterior ventral edge of the lung, and opens there by a very wide *posterior intermediate ostium* into the corresponding air-sac.

The *entobronchia* ("bronches diaphragmatiques," Sappey) are four in number. They take their origin in wide openings of the dorsal wall of the vestibule. The *fourth* is hindermost, runs almost directly backwards to the posterior end of the lung, and ends there cæcally. Branches are given off only from its ventral wall.

The *third* entobronchium runs parallel with this, giving off a number of close-set branches from its dorsal side, which are distributed over the superior facet. Close to the entrance of the bronchus, this presents the large *anterior intermediate ostium* for the corresponding air-sac.

The *second* entobronchium passes directly dorsad, and ramifies over the middle of the superior facet. A wide branch descends to the *subbronchial ostium*.

The *first* entobronchium curves sharply round the entrance of the bronchus, and from its anterior or convex wall gives off a number of branches to the anterior part of the superior facet and to the anterior inferior facet. One of these branches passes directly forwards, and opens by the *præbronchial ostium* into the præbronchial air-sac; while the inferior end of the trunk opens below the bronchus, into the subbronchial ostium, and, in that way, communicates with the subbronchial air-sac.

Thus the mesobronchium and the first entobronchium are each connected with two air-sacs—the former with the posterior two, and the latter with the anterior two; while the middle air-sac (anterior intermediate) communicates with the third entobronchium so close to the vestibule that it might almost be said to open into the latter.

Behind the vestibule, the mesobronchium gives off successively several (usually six or seven) branches, which are directed laterally and dorsally towards the lateral or costal face of the lung. These are the *ectobronchia* ("bronches costales," Sappey).

Those parts of the walls of the various bronchia and their rami tions, which are in relation with the pulmonary parenchyma, are perforated by minute rounded apertures. These lead into canals which are directed, at first, more or less at right angles to the surfaces of the bronchia upon which they open, and pass, side by side, sometimes anastomosing with one another, to some other bronchium than that from which they start. They may be termed *parabronchia* ("canaux tertiaires," Cuvier; "bronchial tubes," Rainey; "Lungenpfeifen" of the Germans). The lumina of these canals are interrupted at pretty regular intervals by transverse circular folds which contain unstriped muscular fibres. The interspaces between these folds are more or less subdivided by oblique or longitudinal folds of a similar nature into *fossæ*; and the walls of these fossæ present smaller depressions or *fossulæ*, which directly, or indirectly, open into the *intercapillary air-passages*. These last occupy the meshes of the capillary network into which the pulmonary vessels resolve themselves.

This description (with possibly some variation in the number of the ostia and air-sacs) applies to the respiratory apparatus of every known bird, and to that of no other animal; but it also applies, almost word for word, to *Apteryx*. Hence there can be no doubt that the respiratory organs of this bird are thoroughly and typically ornithic, and that they present not the slightest approximation to those of the Mammalia.

If the organs of respiration of *Apteryx* are compared with thos of a carinate bird of similar size and form of trunk, such as a Duck, the resemblances and differences between the two can be easil traced.

1. The Duck's lungs are considerably larger both absolutely an relatively.

2. The anterior ventral margin in the Duck is longer than th posterior. The reverse obtains in *Apteryx*.

3. The pulmonary aponeurosis of the Duck is very delicate; i *Apteryx* it is strong and thick.

4. The median vertical septum in the Duck is much deeper, an anteriorly it is supported by the long hypapophyses of the anteri thoracic vertebræ. At the same time it is far less strongly fibrou than the corresponding structure in *Apteryx*. The mesial attachmen of the pulmonary aponeurosis is to the ventral edge of the septum close to that of the oblique septum, in the Duck; while in *Aptery* the two are separated by a considerable interval, throughout whic the thin and membranous part of the dorsal median septum divide the mesial ends of the intermediate and posterior loculi from on another.

In the Duck, the median dorsal septum lies throughout betwee the superior facets of the internal faces of the two lungs. In othe words, this superior facet is much deeper in the Duck than i *Apteryx*.

5. The oblique septum is extremely thin and weak in the Duck while in *Apteryx* it is a very strong aponeurotic membrane, with interlacing fibres diverging from two tendons attached to the unde face of the posterior thoracic vertebræ. In the Duck it contains, o

Fig. 1.

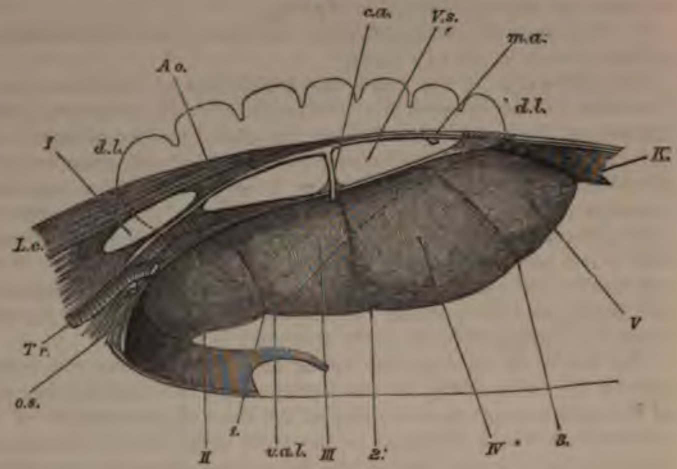

Fig. 2.

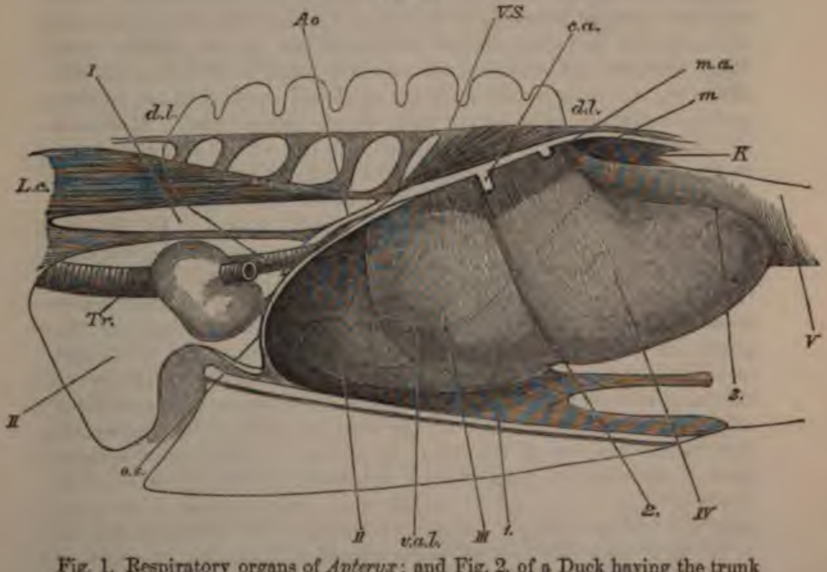

Fig. 1. Respiratory organs of *Apteryx*; and Fig. 2, of a Duck having the trunk of nearly the same dimensions. In each the vertebral column and the left wall of the thoracic and abdominal cavities are supposed to be removed; while the median vertical septum, the right half of the oblique septum, and the air-sacs of the right side are left. The contour of the right lung is indicated.

d. l, dorsal margin of the lung; *v. a. l*, ventral angle of the lung; I, præbronchial, II, infrabronchial, III, anterior intermediate, IV, posterior intermediate, V, posterior air-sac; 1, 2, 3, dissepiments.

L. c, *longus colli*; *V. s*, vertical median septum; *o. s*, oblique septum *Tr*, trachea; *Ao*, aorta; *c. a*, cœliac artery; *m. a*, mesenteric artery; *K*, kidney. *m*, smooth muscular fibres in the oblique septum of the Duck.

each side, a layer of unstriped muscular fibres. I have not been a
to make out any such fibres in *Apteryx*.

6. The most remarkable difference, however, lies in the developme
of the air-sacs in the two birds.

In *Apteryx*, as in the Duck, the attachment of the dorsal end
the dissepiment between the intermediate loculi corresponds w
the exit of the cœliac artery from the dorsal median septum; a
the relation of the air-sacs in front of and behind this dissepiment
the bronchia which open into them is such, that there can be
question of their homology with the *anterior* and the *poster*
intermediate air-sacs in the Duck, notwithstanding the vastly grea
size of the latter. Hence the air-sac in front of the anterior int
mediate in *Apteryx* must be the homologue of the subbronchial
the Duck; and the position of this sac and its relation to the s
bronchial ostium leave no doubt that such is the case.

But while, in *Apteryx*, the subbronchial air-sac does not exte
beyond the front margin of the sternum, and is floored by that p
of the oblique septum which lies at the sides of the fore part of
pericardium and is attached to the front edges of the sternum,
the Duck only a small part of the sac is thus related to the obli
septum, and even this extends much further backwards and m
towards the median line than in *Apteryx*. In front, each of th
sacs has enlarged forwards to the space between the furcula and
sternum, and there has opened into its fellow in the middle li
Thus the two subbronchial air-sacs are fused into one great
chamber, and their mesial walls are so closely applied to the trac
and great vessels as to invest them like a serous coat. Moreo
the common sac sends prolongations into the axillæ and elsewh
and communicates with the pneumatic cavities of the adjacent bo
A similar modification has taken place in the posterior air-sacs of
Duck, but has been carried to a still greater extent. In *Apte*
the whole of this sac is enclosed between the oblique septum
the pulmonary aponeurosis, the dissepiment between its loculus
that of the posterior intermediate sac being situated almost mid
between the second dissepiment and the posterior extremity of
pneumatic chamber. In the Duck, on the contrary, the dorsal
of this dissepiment is attached close to the posterior extremity
the lung, and thence slopes very obliquely backwards. The capac
of the posterior intermediate air-sac thus becomes greatly increas
But, as the capacity of the posterior air-sac is also vastly grea
than in *Apteryx*, its posterior wall has been, apparently, driven
like a hernial sac, between the peritoneum and the parietes, and
jects into the abdominal cavity. It would be incorrect, theref
to say that the abdominal air-sac is absent in *Apteryx*: it is just
much present as in any other bird; but its small size and the sm
relative development of the posterior intermediate sac permit it
occupy a different position.

7. The first or præbronchial air-sac has hitherto been overlook
in *Apteryx*. It is of a long ovate or spindle-shape, 21 millim. lo
by 8 millim. wide in the middle, and lies between the *longus c*

with the vertebral column above, and the œsophagus and bronchus below. Laterally, it is bounded by so much of the anterior facet of the lung as lies above the level of the bronchus. Mesially, it is widely separated from its fellow by the fibrous tissue continued from the anterior end of the median vertical septum onto the œsophagus, bronchi, and aorta.

The præbronchial air-sac in the Duck is fully three times as long, and sends off prolongations to the vertebral column, which have been described by Sappey.

8. The vestibule, mesobronchium, and entobronchia of *Apteryx* present no important differences from those of the Duck, except that the branches of the entobronchia are less numerous.

The ectobronchia, on the other hand, are much smaller, and only the most anterior reaches the lateral surface of the lung, and there divides into an ascending and a descending superficial branch of small size; the others break up into parabronchia before reaching the surface of the lung.

9. The parabronchia are much wider in *Apteryx*, the diameters of their cavities varying from 1·5 millim. to 0·8 millim., while they range from 0·8 to 0·4 millim. in the Duck Moreover the intervening vascular parenchyma is relatively much narrower in *Apteryx* than in the Duck. Hence a section of the lung of the former appears much more coarsely spongy than one of the latter. In the Duck, as in many other Carinate birds, the parenchyma around each parabronchial canal is defined by linear interspaces from that of adjacent parabronchia; and in transverse section these boundaries have a polygonal, usually hexagonal form. In *Apteryx*, the parenchyma between the parabronchial tubes is continuous, and the intercapillary air-passages show no interruption.

In the Duck, as in most Carinatæ, the fossulæ lead into branching passages (intercellular passages of Rainey), which radiate towards the periphery of the area of parenchyma which belongs to each parabronchium, finally ending in the intercapillary passages. In *Apteryx*, the fossulæ are mere shallow pits which open at once into the intercapillary passages.

Thus the respiratory organs of *Apteryx* are thoroughly ornithic, differing from those of other birds chiefly in the greater width and smaller aggregate surface of the respiratory passages, in the rudimentary condition of the pneumatic sacs, and in the much greater strength of the pulmonary and septal aponeurotic expansions.

Neither in *Apteryx*, nor in any other bird, has either of these the slightest real resemblance to a Mammalian diaphragm. For, as has been seen, the heart lies altogether behind both, and the muscular digitations of the pulmonary aponeurosis are supplied by the intercostal nerves, the phrenic being absent. The vertical and oblique septa really answer to the fibrous tissue of the posterior and middle mediastinum in Mammals.

In this, as in all other cases, the meaning of ornithic peculiarities of structure is to be sought, not in Mammals, but in Reptiles. It is only among Reptiles that we meet with pneumatic bones similar to those of birds (Crocodilia, Pterosauria, Dinosauria), pulmona air-sacs (Chamæleonidæ), and membranous expansions which a comparable to the septa in birds.

In Crocodiles, which approach birds in so many other ways, t resemblance is closest. As in birds, the liver lies between the stoma and the pericardium, and has a peculiar peritoneal investment shut o from the great sac of the abdomen : and, as in the Ostrich, the who circumference of the stomach is united by fibrous tissue with t parietes. A fibrous expansion extends from the vertebral colum over the anterior face of the stomach, the liver, and the dorsal a front aspect of the pericardium, to the sternum and the parietes the thorax, separating the thoraco-abdominal space into a respir tory and a cardio-abdominal cavity, and representing the obliq septum of the bird. The respiratory cavity is similarly divide into a right and left chamber by a very deep median septu traversed from before backwards by the œsophagus, trachea, a pneumogastric nerves, and containing the aortic arches. Each these chambers is occupied by one of the lungs, the mesial fa of which is closely adherent to the septum, while the lateral fac though quite free, naturally fits closely to the parietes. As the are no air-sacs, each chamber has only one story.

When the lung is distended, its dorsal margin extends far up on t sides of the bodies and arches of the vertebræ, the height of which see to be related to this dorsal expansion of the lung[1]. A broad, th muscle arises, on each side, from the anterior margin of the pubis; a its fibres pass forwards, diverging as they go, to be inserted into t ventral face of the posterior part of the pericardium and into the ve tral and lateral parts of the fibrous capsule of the stomach, passi between that organ and the adherent posterior face of the liver, a being inserted into the fibrous aponeurosis which covers the anteri face of the stomach, and represents the oblique septum.

Each bronchus is continued directly backwards into a wide cana which dilates into an oval sac-like cavity at the posterior end of t lung, representing the mesobronchium with the posterior air-sac birds.

In the dorsal and mesial wall of the mesobronchium there are f or six apertures, which lead into as many canals, representing t entobronchia in birds. These pass, the anterior two almost direct forwards, and the others more or less obliquely, to the dorsal margi and they lie quite superficially on the mesial face of the lung. T first is very much larger than the others, and ends in a dilatation at t anterior end of the lung. It is united with the second by transver branches. Along the ventral margin of the lung there are four sa like chambers, which communicate, in the case of the two anterio with the entobronchia, and, in the case of the two posterior, wi the mesobronchium. Finally, there are two very large canals, extern to these, which communicate with the mesobronchium by large ape tures in its dorsal wall, and give off branches to the outer face of the lung, representing the ectobronchial system of birds. The orifices with which the surfaces of all these canals, except the anterior half of the mesobronchium, are thickly set, lead into depressions, which are often so deep as to become cylindrical passages, simulating the parabronchia of birds.

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[1] It seems not improbable that the great height of the bodies and arches the anterior thoracic vertebræ in some Dinosaurians may be connected with similar modification of the lungs.

Thus, notwithstanding all the points of difference, there is a fundamental resemblance between the respiratory organs of Birds and those of Crocodiles, pointing to some common form (doubtless exemplified by some of the extinct Dinosauria), of which both are modifications.

3. Contributions to the Anatomy of Passerine Birds.—Part VI.[1] On *Xenicus* and *Acanthisitta* as types of a new Family (*Xenicidæ*) of Mesomyodian Passeres from New Zealand. By W. A. Forbes, B.A., Fellow of St. John's College, Cambridge, Prosector to the Society.

[Received June 19, 1882.]

A few months ago I received, through the kindness of my friend Prof. Jeffrey Parker, of the University of Otago, New Zealand, a small collection of birds in spirit from that country, which included most of the peculiar forms of Passeres found there. Amongst them were single specimens of *Xenicus longipes* and *Acanthisitta chloris*, the examination of which has proved to be of especial interest.

The genus *Xenicus* was founded by the late Mr. G. R. Gray[2] for the reception of the *Motacilla longipes* of Gmelin[3], Lafresnaye having some twenty years previously established *Acanthisitta* for Sparrman's *Sitta chloris*[4].

Subsequent ornithological writers have pretty unanimously assigned both these forms to the "Certhiidæ" or their immediate neighbourhood, in company with *Sitta*, *Sittella*, and their allies. The peculiar structure of the tarsus in *Xenicus* first induced me to examine these birds more closely, with the unexpected result that I find that the two genera in question are true Mesomyodian forms, and therefore in no intimate degree related to such Oscines as those just mentioned.

The subjoined drawings of the syrinx of *Xenicus*—with which in all points *Acanthisitta* appears to agree in every essential respect—will show that it has none of the complex nature of that organ in the Oscines, the thin lateral tracheal muscle terminating on the upper edge of a somewhat osseous box formed by the consolidation of the last few tracheal rings, and there being no other intrinsic

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[1] For Part V. *vide antea*, p. 544.

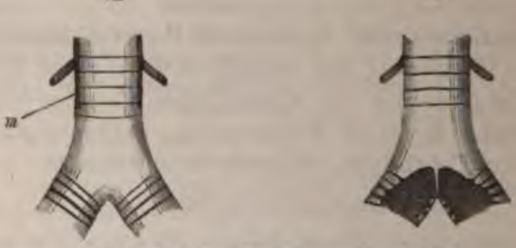
[2] Ibis, 1862, p. 218.

[3] Rev. Mag. Zool. 1842, Ois. pl. xxv

[4] Mus. Carls. fasc. 2, no. 33.

syringeal muscle whatsoever. The box has a well-developed
posterior pessular piece. The bronchial rings are throug
quite simple form, and are separated by but narrow in
None are modified in form to serve for the insertion of
muscle, as the latter terminates higher up, as already descri
the tracheal box, and therefore quite out of the region
bronchi.

The lateral position of the single syringeal muscle is that
teristic of all the Mesomyodian Passeres, though in most of
terminates on one of the bronchial rings, and not, as in th
under consideration, on the sides of the trachea. This may
be seen by comparing the accompanying figures of *Xenicus* w



Syrinx of *Xenicus longipes*, much enlarged.
A. From in front. B. From behind.
m. Lateral tracheal muscle.

beautiful series given by Johannes Muller of the syrinx of many
Neotropical Mesomyodi [1], with those of Garrod of *Pitta* [2], or
of *Eurylæmus*, *Cymbirhynchus*[3], and *Philepitta*[4]. In fact it res
rather that of *Todus*, as lately described and figured by m
Externally the non-oscine nature of *Xenicus* and *Acanthisit*
once proclaimed by the structure of their wings, which have a "
(tenth) primary nearly as long as the preceding one, and
non-bilaminate tarsus. The latter is covered almost complete
single large scute, with only some very obsolete traces of tra
division below, whilst behind its edges are contiguous f
greater length of the tarsus, leaving only small areas at each
that bone, which are covered by very small scutellæ of ir
form. The digits are slender and compressed, the foot being s
syndactyle by the union of the fourth toe to the third f
greater part of its two most basal joints. The tail is sho
weak; and there are only ten rectrices in each of my specimen
there is no evidence of a pair more having been present, this r

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[1] Vocal Organs of Passeres: Garrod's ed., Oxford, 1878.

[2] Coll. Papers, pl. xxvi.

[3] P. Z. S. 1880, pp. 384, 385. [4] *L. c.* p. 389. [5] *Anteà*, p

[6] Sundevall is in error in assigning to these birds only nine remige
tamen, p. 47).

of tail-feathers must be considered to be that normal in the present family, twelve being that universal, with a few isolated exceptions, in all other Passeres.

In all other points, *Xenicus* and *Acanthisitta* conform to the general Passerine type. There is no trace of a plantar *vinculum*. The *tensor patagii brevis* has the peculiar arrangement characterizing the Passeres, only slightly masked by the muscular fibres somewhat concealing the two superimposed tendons, as is frequently the case in the short-and-rounded-winged forms of the group. The *gluteus primus* is well-developed. The tongue is lanceolate and horny, with its apex somewhat frayed out and its base spiny. The main artery of the leg is the sciatic. The sternum has a single pair of posterior notches and a bifid manubrium. In the skull the nostrils are holorhinal, the vomer broad and deeply emarginate anteriorly, the maxillo-palatines slender and recurved.

As regards the affinities of the Xenicidæ, the "haploophone" form of their syrinx, combined with the complete loss of a vinculum, shows that it is only with the Pipridæ (including the Cotingidæ), Tyrannidæ, Pittidæ, and Philepittidæ that they can be compared. From all of these they differ markedly, however, in the number of rectrices, the ocreate tarsus, and the nature of the syrinx, the latter never having the form of a complete bony box, and never lacking a bronchial "intrinsic" muscle in any of the families just enumerated. The Pittidæ they approach somewhat in their general *facies*, short tail, and long tarsus, though the tarsal scutellation is different in the two forms.

The Pittidæ are also, it is interesting to note, the only other family of Mesomyodian Passeres that enters the Australian region, though they have not extended their range to New Zealand. I know at present of no other Australian Passerines that can be considered allied to the Xenicidæ; nor are there apparently any other forms than the two here described present in New Zealand itself, *Certhiparus* and *Miro* both being, as well as *Clitonyx*[1], Oscines of the normal type.

4. On *Trichina spiralis*. By Prof. Owen, C.B., F.R.S., F.G.S., &c.

[Received June 10, 1882.]

The admission, kindly accorded by the Publication Committee, of my paper on *Trichina spiralis* (1835) to the first volume of the 'Transactions of the Zoological Society of London,' leads me to submit a few observations on subsequent references that have appeared in print on the subject of that paper. The general impression so produced is indicated by the following definition by the late lamented "Académicien," Littré, in his admirable 'Dictionnaire de la Langue française:'—"Trichine, s. f. Nom générique d'un helminthe nématoïde, le *Trichina spiralis*, découverte par Hilton et décrit par R. Owen."

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[1] *Vide antè*, p. 544.

Among the notices of the discovery of the microscopic
prior to the date of that 'Dictionnaire,' I may limit mysel
following:—"It was first described, I believe, by Mr. H
Guy's Hospital, and afterwards more fully by Professor C
1835"[1].

The translation of that estimable work probably led to an
common among French practitioners, and which amply just
definition of "Trichine" given by their great lexicographer.

Reference to a number of an English weekly periodical for
of priority could hardly be expected in a foreign country;
own accomplished physician, burthened with an extensive
and professional duties, may well be excused for taking
current statements on so minute a matter.

It may not be unacceptable, or uninstructive to our younge
workers with the microscope, to recall the honest devotion
time and means of observation which the alleged discoverer
the subject of his paper entitled:—"Notes of a peculiar
ance observed in Human Muscle, probably depending upon
mation of very small *Cysticerci*," by John Hilton, Demonst
Anatomy at Guy's Hospital"[2].

After noting that the "body for dissection was a male, ag
the author proceeds:—"The subject was prepared for in
and subjected to a temperature of about 100° Fahr. On pro
to the dissection, our attention was arrested by a mottled
ance of the pectoral muscles; and the same phenomenon p
itself in all the voluntary and respiratory muscles, to which, h
it was confined. The muscles were pale, soft, and not so di
fibrous as usual; between the fibres, and having their lo
parallel to them, there are situate several oval bodies, tran
in the middle and opaque at either end, altogether about
inch in length. *No organization could be discovered with*
of a microscope. A small portion of the muscle, impregnat
them, was inserted under the skin of a rabbit on the back.
was done in three cases; but all the animals died within
two hours, and without any appearance of the bodies in
being revivified."

Portions of the muscles of the same subject were taken
accomplished physician of the Hospital, Dr. Addison, F.R.
in an endeavour to promote some development of the s
Cysticerci, "placed a portion of muscle in a glass tightly
with paper, perforated by pin-holes; it was slightly m
occasionally with water." On referring to it "casually" som
after, "a number of small flies were seen in the glass, ap
differing from the common house-fly, and some bodies were
in the muscle, larger than those originally placed in the glas
some of these an embryo fly was liberated"[3].

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[1] Lectures on the Practice of Physic, by (now Sir) Thomas Wats
8vo, 1845, vol. iii. p. 492.

[2] London Medical Gazette, February 2, 1833, p. 605.

[3] London Medical Gazette, loc. cit. p. 606.

Thus it is plain that, of the two accomplished officers of the great Hospital and Medical School of Guy's, the Prosector or Anatomical Demonstrator came to the conclusion that the corpuscles in question were a minute species of Hydatid or *Cysticercus*; and the Physician inclined to the belief that they were ova of a new species of Dipterous insect; but Dr. Addison candidly owns "an unwillingness to draw an absolute inference from his experiment." The contents of the cyst were neither seen nor suspected by either observer.

Such was the state of knowledge when, early in February 1835, I received from Mr. Wormald, Demonstrator of Anatomy at St. Bartholomew's Hospital, in which Medical School I then held the office of 'Lecturer on Comparative Anatomy and Physiology,' portions of the muscular tissue of a subject to which his attention had been called on account of a gritty sensation perceived in dissection, and which, from the rapid blunting of the scalpels employed, he considered to be caused by deposition of specks of earthy matter.

This was the sole indication which reached me when I made the microscopical investigation, resulting in the discovery of the worm, as detailed in my 'Memoir' communicated to the Zoological Society of London, February 24th, 1835.

In the course of the investigation I inferred that the cysts containing the worm defined as "*Trichina spiralis*" were the corpuscles previously described by Hilton as "*Cysticerci*." At p. 321 of my 'Memoir' I give the facts and inferences which led me to reject the conclusion that the cyst was a kind of Hydatid or *Cysticercus*, and state "that the 'cyst' is adventitious, foreign to the *Entozoon*, and composed of the cellular substance of the muscles infested, morbidly altered by the irritation of the worm"[1].

At the time of this discovery I was unaware of the fact, subsequently noticed in my paper, that Mr. (now Sir James) Paget had taken portions of the affected muscles to the British Museum, where they were microscopically examined in the Botanical Department, and the wormlet in the cyst clearly seen.

Subsequently to the publication of 'Watson's Lectures,' which gave rise to other expressions of opinion besides Littré's, it was announced that both Hilton's and my observations had been anticipated by an eminent Professor of Physiology of Heidelberg. In the issue of the 'Times' newspaper of February 10th, 1866, insertion is given to the following 'Note' from "T. S. Cobbold, M.D., F.R.S., of No. 84 Wimpole Street:"—"Sir, If Mr. Jabez Hogg is in error respecting the discovery of *Trichina*, so also is the Curator of Guy's Museum. The 'little bodies' were first noticed by Tiedemann, in the year 1822, thus anticipating Mr. Peacock by six years."

No reference to the work or publication containing the record of Tiedemann's alleged discovery was given; and the only account which could have suggested or served as a basis of the letter to 'The Times,' I found in the following German periodical—Froriep's 'Notizen,' Band i. S. 64 (1821). It appears as a record of a pathological appearance observed by the eminent Professor of Physiology

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[1] Zool. Trans. loc. cit. p. 322.

Colombia and *S. palpebralis* of Peru, and makes a third of Dr. Cabanis's section *Schizoaëcha* (J. f. O. 1873, p. 319).

I add a list of the species of *Synallaxis* which have been described since the issue of my synopsis (P. Z. S. 1874, p. 2).

(1) SYNALLAXIS TITHYS, Tacz. P. Z. S. 1877, p. 323.
Hab. Lechugal, N. Peru (*Stolzmann*).

(2) SYNALLAXIS SCLATERI, Cab. J. f. O. 1878, p. 196.
Hab. Sierra de Cordova, reip. Arg. (*Doering*). Allied to *S. humilis*, Cab.

(3) SYNALLAXIS MARANONICA, Tacz. P. Z. S. 1879, p. 230.
Hab. Guajango, N. Peru (*Stolzmann*). Allied to *S. cinerascens*.

(4) SYNALLAXIS RUFIPENNIS, Scl. et Salv. P. Z. S. 1879, p. 620.
Hab. Tilotilo, Bolivia (*Buckley*). Allied to *S. striaticeps*.

(5) SYNALLAXIS FRUTICICOLA, Tacz. P. Z. S. 1879, p. 670.
Hab. Tambillo, Peru (*Stolzmann*). Allied to *S. frontalis*, Pelz.

(6) SYNALLAXIS WHITII, Scl. Ibis, 1881, p. 600, pl. xvii. f. 2.
Hab. Prov. Salta, reip. Arg. (*White*). Allied to *S. scutata*, Scl.

8. On the Muscular Anatomy of *Proteles* as compared with that of *Hyæna* and *Viverra*. By M. WATSON, M.D., Professor of Anatomy, the Owens College, Manchester.

[Received June 19, 1882.]

Having recently had an opportunity of investigating the anatomy of a male specimen of *Proteles cristatus* which lately formed part of the Society's collection, I thought it advisable, considering the rarity of the animal, to make a careful dissection of the soft parts.

The osteology of *Proteles* is already well-known through the works of Isidore Geoffroy St.-Hilaire[1] and of De Blainville[2]; and I need not further refer to it beyond stating that in my specimen, as in that examined by Professor Flower[3], the ribs are fifteen in number on each side, and that the dorsal vertebræ are fifteen and the lumbar five in number. The last rib on each side is extremely short, measuring only one inch in length, and on this account had probably been overlooked by St.-Hilaire and De Blainville, according to both of whom the ribs and dorsal vertebræ of *Proteles* are fourteen in number and the lumbar vertebræ six.

The visceral anatomy of *Proteles* has been so carefully described by Professor Flower[4] that I need not do more than refer to the

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[1] Mémoires du Muséum d'Histoire Naturelle, tome xi. 1824, p. 354.

[2] Ostéographie, tome ii. p. 34.

[3] Proc. Zool. Soc. 1869, p. 474.

[4] *Loc. cit.*

The *obliquus externus abdominis* arises in *Proteles* from the last *ten* ribs. In *H. crocuta* it arises from the last *eleven* ribs.

Muscles of the Fore Limb.

In *Proteles* the *pectoralis major* resembles that of *H. crocuta*, but takes an additional origin from the abdominal aponeurosis. The separation of the muscle into two strata is more complete in *Proteles* than in *H. crocuta*. In the former the posterior fibres form almost a separate muscle, which has a special insertion into the great tuberosity of the humerus; while the anterior fibres are inserted, as in *H. crocuta*, into the whole length of the shaft of that bone. In *Viverra* the muscle is divisible into three strata, and its insertion is confined to the upper third of the humerus.

The *deltoid* muscle is not divisible into two parts as in *H. crocuta*, the two portions being quite continuous with one another.

The *levator humeri proprius* (Douglas) of *Proteles* differs from that of *H. crocuta* inasmuch as it is inserted into the upper end of the radius and more especially of the ulna, and not, as in *H. crocuta*, into the lower end of the humerus. In this respect *Proteles* differs likewise from *H. brunnea* and from *Viverra* (according to the observations of Young [1]). According to Macalister [2], however, in *Viverra* this muscle extends, as in *Proteles*, as low down as the upper end of the radius.

The *levator scapulæ* in *Proteles* is chiefly inserted into the fascia covering the infraspinatus, and to a less extent into the acromion process. In *H. crocuta* the reverse is the case.

The *teres minor* in *Proteles* is quite inseparable from the infraspinatus. In this respect *Proteles* differs from both *H. crocuta* and *Viverra*.

The *brachialis anticus* in *Proteles* is inserted partly into the radius and partly into the ulna. In *H. crocuta* it is inserted into the ulna alone.

The *triceps* of *Proteles* differs from that of *H. crocuta* in the possession of a fifth head. This fifth head forms the most superficial part of the muscle, and consists of a narrow fleshy band which arises from the middle in length of the spine of the scapula, where it lies superficial to the infraspinatus. It passes downwards parallel to and in contact with the glenoid head of the triceps, and is inserted into the olecranon process along with the rest of the muscle. This head is absent not only in *H. crocuta* but in *Viverra*.

The *supinator longus* is entirely absent in *Proteles*, not even being represented by a tendinous band as in *H. crocuta*. In *Viverra* the muscle is quite distinct, although of small size.

The *extensores carpi radiales* resemble those of *H. crocuta* inasmuch as they are partially fused together. In this respect *Proteles* differs from *H. striata*, in which these muscles are quite distinct.

The tendon of the *extensor carpi ulnaris* in *Proteles* gives off a large slip which is inserted into the annular ligament of the wrist. In other respects it resembles that of *H. crocuta.*

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[1] *Loc. cit.*

[2] "The Muscular Anatomy of the Civet and Tayra," Proc. Roy. Irish Acad. vol. i. ser. 2, p. 506.

The *extensor minimi digiti* of *Proteles* resembles that of *H. crocuta* in being inserted into the *two* outer toes, and differs from that of *Viverra,* which gives off slips to the *three* outer toes.

The *extensor indicis* in *Proteles* joins the extensor tendon which passes to the *middle* toe, and thus agrees with that of *H. striata,* and differs from that of *H. crocuta,* which joins the extensor tendon of the *second* toe. In *Viverra* the tendon of this muscle gives off slips to the 1st and 2nd toes.

The *palmaris longus* of *Proteles* resembles that of *H. crocuta,* and differs from that of *H. striata,* the tendon of which blends with the superficial flexor tendons of the toes, as also from that of *Viverra,* which is double.

The *flexor carpi ulnaris* of *Proteles* differs from that of *H. crocuta* and *H. striata* in possessing an olecranoid as well as a condyloid origin. In this respect *Proteles* resembles *Viverra.*

The *flexor carpi radialis* resembles that of *H. crocuta* in being inserted into the base of the second metacarpal bone, and differs from that of *Viverra,* which is inserted into the first as well as the second metacarpal.

The *flexores digitorum* of *Proteles* closely resemble those of *H. crocuta* for the most part, but differ inasmuch as that portion of the common muscle which represents the flexor perforatus digitorum divides only into *three* slips, which are distributed to the three middle toes, while in *H. crocuta* it divides into *four* slips, which are distributed to the four perfect toes. In this respect *Proteles* agrees with *Viverra.* In *Proteles,* moreover, the portion of the muscle which represents the flexor perforans divides into *five* slips, one of which passes to each of the toes; while in *H. crocuta* the tendon of the flexor perforans, in accordance with the reduction in number of the toes, divides only into *four* slips.

The *lumbricales* in *Proteles* are *three* in number, and pass to the three outer toes. In *H. crocuta* there are four, one to each toe.

In *Proteles* the *flexor pollicis* is incorporated with the flexor perforans digitorum; whereas in *H. crocuta,* on account of the rudimental hallux, the flexor pollicis is entirely deficient. In *H. striata,* however, Meckel asserts the existence of this muscle.

The *interossei* in *Proteles,* as in *H. crocuta,* are arranged in two layers, a superficial and a deep. The superficial layer includes two muscles, which differ from the corresponding structures in *H. crocuta* inasmuch as they both arise from the base of the *third* metacarpal bone, instead of one from the third and the other from the fourth metacarpal as occurs in *H. crocuta.* The one passes to be inserted into the inner side of the base of the first phalanx of the fifth toe, whilst the other is inserted into the outer side of the base of the second toe. In *H. crocuta* these muscles are inserted into the outer and middle toes respectively.

The deep layer consists of ten muscles arranged in pairs, two to each metacarpal bone. In *H. crocuta*, on account of the rudimen condition of the inner toe, the deep layer of interosseous musc consists only of eight muscles.

Muscles of the Hind Limb.

The *gluteus maximus* of *Proteles* resembles that of *H. crocuta*, b differs inasmuch as the posterior portion of the muscle is qu distinct from and not united with the biceps as in *H. crocuta*. *Viverra* the gluteus maximus presents a totally different arrang ment.

The *pyriformis* in *Proteles*, as in *H. crocuta*, *H. striata*, a *Viverra*, is quite distinct from the gluteus medius.

The *gluteus medius* is not divisible into two planes of fibres as *H. crocuta*.

A *gluteus quartus* is present in *Proteles*, as in *H. crocuta* a *Viverra*. The insertion of this muscle in *Proteles* is considerab lower than in *H. crocuta*. In the latter it occupies the middle the anterior intertrochanteric line, whereas in the former it is i serted into the inner side of the shaft of the femur half an in below that line.

There is only a single *gemellus* in *Proteles*. It is a strong muscul bundle which surrounds the tendon of the obturator internus. *H. crocuta* and in *Viverra* the gemelli are two in number.

The *quadratus femoris* is entirely absent in *Proteles*, which ther fore differs both from *H. crocuta* and *Viverra*.

The *semimembranosus*, as in *H. crocuta*, is either absent or inseparably united with the adductor magnus. In this respect *Pr teles* differs from *Viverra*, in which the semimembranosus is qui distinct from the adductor magnus.

The *semitendinosus* of *Proteles* is inserted into the tibia low down than in *H. crocuta*. In this respect *Proteles* resembles *striata*. In *Viverra* this muscle has an additional caudal origi which is not present either in *Hyæna* or in *Proteles*.

The *sartorius* of *Proteles* differs from that of *H. crocuta* ina much as the muscular fibres in the upper third of the thigh for a single mass, which only divides into two parts lower down. *H. crocuta* the two parts are separate from end to end ; in *Viverr* on the other hand, the muscle is single.

The *gracilis* is not attached directly to the pelvic bone as in *crocuta*, but arises from a strong aponeurosis covering the adduct muscles. Its fibres are continuous with those of the opposite muscl Its insertion differs from that of the muscle in *H. crocuta* inasmu as the lower fibres are inserted into a stout fibrous band which li parallel with, and is inserted into the inner side of the tibia at t junction of the lower and middle thirds of that bone.

In *Proteles*, as in *H. crocuta*, the *pectineus* is single at its inse tion. In *Viverra* it is double.

The origin of the *adductor brevis* is relatively more extensive *Proteles* than in *H. crocuta*.

The *rectus femoris* of *Proteles* differs from that of *H. crocuta* a

9. Description of a new Species of Rat from China. By OLDFIELD THOMAS, F.Z.S., British Museum.

[Received June 19, 1882.]

(Plate XLIV.)

The specimens upon which the following description is founded were sent to the Paris Museum by the Abbé Armand David; and I have been asked by Prof. A. Milne-Edwards to describe them, as they represent a most interesting and remarkable new species.

Four specimens were obtained; and of these Prof. Milne-Edwards has been good enough to let the British Museum have one, the specimen *b* measured below; and I have also myself examined and determined the others in the Paris Museum. I propose to call the species

MUS EDWARDSI, sp. n. (Plate XLIV.)

Fur rather short, fine and soft, though mixed with numerous slender spines. General colour above yellowish grey, the yellow more strongly marked on the sides. Hairs slate-coloured with pale yellow tips; spines white with black tips; chin, chest, and belly pure white, the line of separation well defined. Outer side of legs slaty grey. Fore feet white; hind feet with the upperside of the tarsus grey and the toes white. Tail about the length of the head and body (stuffed, in spirit-specimens probably markedly longer), sharply bicolor dark grey and white for half its length; and then the dark upper colour gradually disappears, and the terminal three inches are wholly white. Ears large and rounded, uniformly grey. Hind foot-pads very large; fifth hind toe, without claw, reaching to just beyond the base of the fourth.

Skull with the elongated muzzle, open infraorbital foramen, and but slightly developed perpendicular plate found in *M. jerdoni*, Blyth, and in the other members of the group of Rats to which the present species belongs.

Dimensions (from stuffed specimens) in English inches and tenths:—

	a.	*b.*	*c.*
Head and body (approximately)[1] ..	12·6	11·8	11·2
Tail	12·0	11·05	10·9
Hind foot	2·03	2·03	1·96
Ear-conch, length	1·0	·93	·86
Skull, total length	2·41	2·30	2·18

Other dimensions of skull of *b*:—greatest breadth 1·0; length of

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[1] Père David's labels give the measurements in the flesh of specimens *a* and *c* as follows:—*a*. Head and body 11·4, tail 12·2. *c*. Head and body 11·0, tail 11·8. The bodies have therefore been stretched in the stuffing, while the tails have contracted, a process which always renders measurements from stuffed specimens very deceptive.

XLV. fig. 2). The type is from Teté; and the species may be diagnosed as follows.

E. *similis* E. paenæ *et cauda rufa insignis, sed fascia alba duplici alari, præpectore nigro striolato distinguenda.*

I add a detailed description:—

Adult. General colour above sandy rufous, slightly greyer on the head and mantle, more rufous on the lower back, rump, and upper tail-coverts; median and greater coverts brown, edged with sandy rufous and tipped with white so as form a double wing-bar; bastard wing dark brown, edged with white; primary-coverts and quills dark brown, externally edged with sandy rufous, which is paler and broader on the secondaries; tail-feathers chestnut, the centre feathers tipped with fulvous, before which is a broad subterminal band of dark brown, this band being broader on all the other feathers, which are tipped with white, the outermost feather being also externally edged with white; lores and feathers round the eye buffy-white, separated from the crown by a narrow line of black, scarcely sufficient to call an eyebrow; ear-coverts, cheeks, and sides of neck light sandy rufous, the ear-coverts with whitish shaft-lines; throat and under surface of body white, with a narrow moustachial line of blackish streaks; fore neck and chest also streaked with blackish; sides of body and flanks pale sandy rufous: thighs and under tail-coverts white; under wing-coverts and axillaries white; quills brown below, the inner edge ashy whitish. Total length 5·2 inches, culmen 0·7, wing 2·55, tail 2·5, tarsus 0·95.

The fourth species is from the Congo region; and I propose calling it *E. ruficauda*, sp. n. (Plate XLV. fig. 1.)

E. *similis* E. zambesianæ, *sed pileo fusco (nec arenario dorso concolori) distinguenda.*

Syn. *Aedon leucophrys*, Sharpe and Bouvier, Bull. Soc. Zool. France, 1876, p. 305 (nec V.).

Hab. Malimbe, Congo.

Adult. General colour above rusty brown, becoming clear rufous on the lower back and rump; lesser wing-coverts dusky, edged with sandy brown; median and greater series dusky, tipped with white, forming a double wing-bar; bastard wing dusky, edged with white; primary-coverts dusky, fringed with fulvous; quills dusky brown, externally rusty brown, whitish at the tips, more broadly so on the secondaries; primaries with a fulvescent spot at the base; upper tail-coverts clear rufous like the rump; tail-feathers rufous, broadly tipped with white, with a broad subterminal black band, the two centre feathers not tipped with white, rufous on the inner web and near the shaft on the outer one, dusky brown along the outer web and at the tip; crown of head, nape, and hind neck more of a dusky ash-brown than the back; lores and a distinct eyebrow white, reaching from the base of the nostril to above the ear-coverts, and separated

from the crown by a narrow blackish line; feathers in front o
eye dusky blackish; below the eye a white spot; ear-coverts
brown, dusky on the upper and hinder margin; cheeks w
separated from the ear-coverts by a broad dusky streak, and
the throat by another distinct moustache of dusky black; sid
neck like the head and hind neck; fore neck and chest w
tinged with sandy buff, and mottled with triangular spots of d
blackish, inclining to narrow hair-like streaks on the breast;
latter white, as well as the abdomen; sides of body and flanks
sandy buff; thighs white; under tail-coverts light buff; u
wing-coverts and axillaries white; quills dusky below, whitish a
the inner edge of the quills. Total length 5·2 inches, culmen
wing 2·45, tail 2·2, tarsus 0·95.

11. On a new Species of *Muscicapa* from Western Af

By R. Bowdler Sharpe, F.L.S., F.Z.S., &c., Dep
ment of Zoology, British Museum.

[Received June 20, 1882.]

My late friend Governor Ussher, during his last visit to the
Coast, which terminated so fatally for him, devoted conside
time to collecting birds, as was his wont; and both to Captain Sh
and myself he wrote frequently respecting his collections, w
included many rare species from Denkera, and from the eas
districts of the Gold Coast, Aguapim, &c. In one letter he sp
of having got six specimens of *Picathartes gymnophthalmus*; a
is certain that, if it had reached England, the collection would
proved to be of great interest. Unfortunately, since his d
the birds have disappeared, and I am informed by his friend C
Barrow, who has interested himself in the matter, that there
no such collection remaining among his effects.

Nevertheless a few birds have arrived in London bearing labe
the late Governor's handwriting; and certain of them have
offered for sale to the British Museum, which has acquired some o
most interesting specimens. As these were offered by most res
able agents, who had acquired them in the ordinary way of busi
there is not the slightest proof that they formed part of the
Governor's large collection; for they may very probably have
given away by him before his death, and have been thus dispos
in England. They were all birds of dull coloration; but am
several others of interest there appears to be one Flycat
which is undescribed, and which I propose to call after my
friend, to whom I myself and ornithologists generally were so
indebted for his exertions in collecting, often in countries w
the climate rendered the task one of considerable difficulty
danger.

MUSCICAPA USSHERI, sp. n.

Adult. General colour above light brown, slightly more fulvescent brown on the lower back and rump; lesser and median wing-coverts a little more ashy than the back; greater coverts, primary-coverts, and quills dusky brown, externally edged with the same brown as the back; tail-feathers dusky brown, externally edged with brown like the back, and very narrowly fringed with whitish along the tip and near the end of the inner web; nasal plumes and lores dull white, extending above the fore part of the eye so as to form a slight superciliary streak; eyelid and feathers below the eye dull white; the ear-coverts very light brown with dull whitish shaft-lines; cheeks and throat buffy white, with a tinge of fawn-colour on the fore neck; breast, abdomen, and under tail-coverts white, the latter with light-brown centres; sides of breast, flanks and thighs light brown tinged with fawn-colour; under wing-coverts and axillaries ochreous buff; quills dusky below, whitish along the edge of the inner web; bill horn-brown, whitish at the base of the lower mandible. Total length 5 inches, culmen 0·55, wing 2·8, tail 2·2, tarsus 0·85.

Hab. Abokobi, Gold Coast, Feb. 1880.

This species has the appearance of an *Erythrosterna*; but the colour of its tail separates it from any of the species with which I am acquainted; otherwise it comes into the "Key to the Species" of *Muscicapa* in my 'Catalogue' (vol. iv. p. 150) as follows:—

a. With no white bar on the wing and with no white at base of tail.
  a'. Breast white, with brown streaks &c.
    a''. Ashy brown &c. .... *grisola*, p. 151.
    b''. Dark brown &c. .... *griseisticta*, p. 153.
  b'. Breast uniform, without streaks.
    c''. General colour above brown, ashy grey or slate-colour: size large, wing 2·8 to 3·1 inches.
      a'''. Bill horn-brown, the base of the lower mandible yellowish white.
        a^4. Under wing-coverts and axillaries brown; upper surface brown .... *aquatica*, p. 154.
        b^4. Under wing-coverts and axillaries ochreous buff; upper surface brown........................... *ussheri*, sp. nov.

12. Notes on Birds collected in the Argentine Republic. By E. W. WHITE, F.Z.S. With Notes by P. L. SCLATER, M.A., Ph.D., F.R.S.

[Received June 12, 1882.]

In travelling over the greater part of this vast Republic, I have found the difficulties and dangers great, and the distances to be surmounted, from one hunting-ground to another, immense. Not only so, but the naturalist here, unlike his brother in Europe, receives no encouragement, enjoys no facilities, and is obliged to

rely upon his own resources in a way that renders collecting
arduous, besides being at times an object of suspicion. Owi
my bad state of health, I did not commence operations upo
avifauna of this part of the Neotropical region until the year 1
and then my trips to Oran, Misiones, and other promising di
were, from one cause and another, generally so hurried, that, as
unable to remain in desirable spots even for a few days, muc
through the season (a step so essential to the observation
habits of birds), not only will my notes be characterized by
what of baldness, but certain families, such as the Alcedinida
be found entirely, and others, such as the Strigidæ, but
represented, which undesirable result has been further contri
to by the loss of some of my manuscripts.

It is not to be inferred from this, however, that many spe
these families have not come under my observation, but simpl
as yet they form no part of my private collection. However,
remarks and data herewith furnished I have paid much att
to secure accuracy, and I indulge in the hope that they will b
sidered of some value. With regard to the nomenclature, in
I have followed the 'Nomenclator Avium Neotropicalium' of M
Sclater and Salvin, I anticipate there will be found few inaccu
of any import, although Buenos Aires does not possess the fa
which London enjoys for the accurate determination of species

My earnest desire is to be able before long to suppleme
present with additional notes, until this country shall be prett
exhausted of its feathery inhabitants.

Buenos Aires, May 5, 1882.

[I have examined several series of Mr. White's birds, an
great pleasure in testifying to the general accuracy of his de
nations. But, as he has given me full authority over his MS.,
thought it right to add a few remarks in certain cases when I
not seen specimens and there is some cause to doubt.
remarks are indicated by my initials.—P. L. S.

London, June 12, 1882.]

1. TURDUS LEUCOMELAS, Vieill.

♂. Concepcion, Misiones, Arg. Rep., June 23, 1881.
♀. Santo Tomé, Corrientes, Arg. Rep., May 11, 1881.
♀. Concepcion, Misiones, Arg. Rep., June 20, 1881.
Iris dark brown.

Shot in the woods around the old Jesuit ruins. These bir
plentiful all over Misiones, and are often kept as cage-birds, a
have a pleasant whistle.

2. TURDUS RUFIVENTRIS, Vieill.

♂. Oran, Salta, Arg. Rep., Nov. 18, 1880.
Iris sepia.

During my sojourn in Oran I did not meet with many
species; but in the dense woods of Misiones they are abundan

having shot and wounded one, I found its cries attract other birds, so that I had no difficulty in securing seven or eight other desirable species, whereas before they would not show themselves.

3. TURDUS FUSCATER, Lafr. et d'Orb.

♂. City of Catamarca, Arg. Rep., Aug. 7, 1880.
♀. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 9, 1880.
Iris brown.

I have noticed this bird in the provinces of Mendoza, San Juan, San Luis, Cordova, and Catamarca, where it is much esteemed as a cage-bird on account of its beautiful whistle. In Mendoza it goes by the name of Sorsal, in Catamarca and Cordova by that of Merlo, and in Andalgala Chocoyno; in the last mentioned place it is seen generally about the hedges round the town. In Catamarca, however, it is only observed during winter and spring. The Italians settled in the town of Mendoza are very fond of its flesh, and are rapidly exterminating it in that neighbourhood.

4. MIMUS TRIURUS, Vieill.

♀. Flores, B. Aires, Arg. Rep., Jan. 24, 1882.
Iris stone-colour.
This bird is rare near Buenos Aires.

5. MIMUS CALANDRIA (Lafr. et d'Orb.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 9, 1880.
♀. San José de Flores, Buenos Aires, Arg. Rep., April 1, 1881.

The native name of this bird, which is found all over the Republic, is Calandria. It delights to frequent shrubby plains, flying from the top of one tree to another. This is a song-bird of great capacity, having a great range of notes, being able to vary them so that it is mistaken for other birds. The grape-crops in Andalgala suffer much from the ravages of this bird. The breeding-season in Buenos Aires lasts from October to the end of January.

The nest, which is built of twigs and neatly lined with horsehair, has an exterior height of 5 to 6 inches and an exterior diameter of from 4 to 5 inches, with a depth of about 4 inches in the interior cup. Four eggs are laid in a clutch. The ground-colour is a light blue, thickly sprinkled with small rufous spots throughout. Measurement: axis 27 millim., diam. 20 millim.

6. POLIOPTILA DUMICOLA (Vieill.).

♂ and ♀. Monte Grande, B. Aires, Arg. Rep., Jan. 2, 1881.
Iris sepia.

I found this bird tolerably abundant amongst the tala groves at Monte Grande.

7. TROGLODYTES FURVUS (Gm.).

♂ and ♀. San José de Flores, B. Aires, Arg. Rep., March 23, 1881.
Iris dark.

12. Setophaga brunneiceps, Lafr. et d'Orb.

♂. Sierras de Totoral, Catamarca, Arg. Rep., July 30, 1880.
♀. „ „ „ July 24, 1880.

This rather scarce bird, very quick in its movements and difficult to shoot, was bagged on the sierras of Totoral as it was skipping about amongst the branches very much like the Tits of England.

[The occurrence of this species in the Argentine Republic is quite new to me. Mr. White's skins agree with Bolivian specimens.—P. L. S.]

13. Hylophilus pœcilotis (Max.).

♂. San Javier, Misiones, Arg. Rep., June 10, 1881.

Iris dark.

Not uncommon in Misiones.

[Not known to me from any part of the Argentine Republic.—P. L. S.]

14. Cyclorhis viridis (Vieill.).

♂. Punta Lara, B. Aires, Arg. Rep., Feb. 21, 1881.
♀. „ „ „ Feb. 23, 1881.

Iris brick-red.

This bird I have met with plentifully in many parts of the Republic.

15. Progne purpurea (Linn.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 28, 1880.

Iris sepia.

I only obtained one of these birds.

16. Progne chalybea (Gm.).

♂. Flores, B. Aires, Arg. Rep., Dec. 6, 1881.

Iris dark.

This bird is very common in the neighbourhood of Buenos Aires, where it builds under the eaves of the houses; the nest is low, entirely open, and built on a foundation of mud, which when dry is covered with straw and then lined with feathers and wool. Three perfectly white and pear-shaped eggs in a clutch. Axis 23 millim., diam. 17 millim.

17. Progne tapera (Linn.).

♂. Monte Grande, B. Aires, Arg. Rep., Jan. 4, 1881.
♀. Pacheco, B. Aires, Arg. Rep., March 12, 1881.

Iris dark brown.

Is a very common bird in the province of Buenos Aires. Its nest is composed of twigs and dry grass; but I do not think it is particular as to the locality in which it builds.

18. Petrochelidon pyrrhonota (Vieill.).

♂. Flores, B. Aires, Arg. Rep., Dec. 11, 1881.

Iris dark.

I shot this bird when on the wing quite by accident, as it was so high up that I could not mark any difference between it and num of *Progne tapera* flying about.

It is the only one of this species that I have seen in Buenos A

19. HIRUNDO LEUCORRHOA, Vieill.

♂. Santo Tomé, Corrientes, Arg. Rep., May 16, 1881.
Iris dark.

I found this species very abundant near Santo Tomé; my spec I obtained when numbers of them were flying over a small la close to the river Itacua.

20. ATTICORA CYANOLEUCA (Vieill.).

♂. Salto, Buenos Aires, Arg. Rep., Oct. 18, 1881.
♀. Catamarca, Aug. 5, 1880.

This pretty little bird is found abundantly distributed over campos. It builds its nest within the burrows of the Biscacha (*L* *stomus trichodactylus*); and half a dozen more may be seen at a flying round their holes.

21. COTILE FUCATA (Temm.).

♂. Santo Tomé, Corrientes, Arg. Rep., May 16, 1881.
Iris dark.

Several of these birds I saw flying about with the *Hirundo* *corrhoa* near the Itacua.

22. EUPHONIA CHLOROTICA (Linn.).

♂. Concepcion, Misiones, Arg. Rep., June 28, 1881.
♀. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 20, 1
Iris dark.

At Concepcion, in the old Jesuit ruins, I saw three or four of pretty little birds on a giant cactus some 40 or 50 feet high, w they were busy pecking the ripe pear-like fruit. I obtained male and two females; but they were not common.

23. TANAGRA STRIATA (Gm.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 10, 1
♀. Punta Lara, B. Aires, Arg. Rep., Feb. 24, 1881.
Iris brown.

I have found this bird distributed over nearly all the Rep I obtained a specimen of this bird the feathers of which in th wing were in a peculiar abnormal condition.

24. TANAGRA SAYACA, Wied.

♂. Oran, Salta, Arg. Rep., Nov. 18, 1880.
♀. „ „ Nov. 12, 1880.
♂. Punta Lara, B. Aires, Arg. Rep., Feb. 23, 1881.
Iris sepia.

This species is also common over most of the Republic. In they are found abundantly in the orange-groves, and utter u only a few low notes that are very misleading as to their w abouts. I have obtained specimens both in Oran and Buenos Aires; but they vary a good deal—the Oran birds being smaller and the glossy colour a distinct blue, whereas in the Buenos-Aires bird it is green; and, moreover, the habits of the birds also seem to vary slightly.

[I am a little doubtful whether Mr. White's specimens really belong to the true *T. sayaca*; but it is very difficult to determine accurately the various races of this group of Tanagers. —P. L. S.]

25. Stephanophorus leucocephalus (Vieill.).

♂. Concepcion, Misiones, Arg. Rep., June 27, 1881.

This bird is not uncommon in Misiones, where it frequents the outside of thickets near the open, or sometimes the open itself, amongst large weeds, on the seed-pods of which it feeds, but is rarely found in dense woods.

26. Trichothraupis quadricolor (Vieill.).

♂. Concepcion, Misiones, Arg. Rep., June 23, 1881.
♀. San Javier, Misiones, Arg. Rep., June 7, 1881.
Iris dark.

I shot these birds in the dense forest.

27. Tachyphonus cristatus (Gm.).

♂. San Javier, Misiones, Arg. Rep., June 6, 1881.
Iris dark.

An immature specimen, with no white mark under the throat, as is usual in the adult, the whole bird being of a decided ferruginous brown, slightly darker on the back and the top of the head. I obtained my specimen in the forest on the banks of the river Uruguay.

[I have never seen examples of this species from so far south.—P. L. S.]

28. Arremon d'orbignii, Scl.

♂. Sierras de Totoral, Catamarca, Arg. Rep., July 29, 1880.
Iris light blue.

Met with on the outskirts of the woods, but seldom within them.

[One of Mr. White's skins in my collection is marked *A. polionotus*, Bp. It is, however, probably *A. d'orbignii*, mihi, although I have no Bolivian skins for comparison.—P. L. S.]

29. Saltator superciliaris (Spix).

♂ ♀. Santo Tomé, Corrientes, Arg. Rep., May 11, 1881.
Iris wood-brown.

Not uncommon at Santo Tomé.

30. Saltator cærulescens, Vieill.

♂. Oran, Salta, Arg. Rep., Nov. 6, 1880.
♀. " " Nov. 13, 1880.
Iris sepia.

I found these birds very abundant in Oran.

31. SALTATOR AURANTIIROSTRIS, Vieill.

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 8, 1880.
♀. Oran, Salta, Arg. Rep., Nov. 9, 1880.

Iris sepia.

Not uncommon at Andalgala.

32. PHEUCTICUS AUREIVENTRIS (Lafr. et d'Orb.).

♂ ♀. Campo Santo, Salta, Arg. Rep., Nov. 29, 1880.

Iris sepia.

I saw three or four of these birds about, and shot a brace, in th dense and lofty forest on the banks of the Mojotoro.

33. GUIRACA CYANEA (Linn.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 22, 1880
♀. „ „ „ Sept. 8, 1880.

Iris brown.

Not uncommon around Andalgala in hedges and thickets. Th male is of a deep blue, and the female a drab.

34. SPERMOPHILA CÆRULESCENS, Vieill.

♂. Flores, Buenos Aires, Arg. Rep., Nov. 26, 1881.
♀. „ „ „ Dec. 15, 1881.

Iris dark brown.

This bird, which is very quick in its movements, builds a ve delicate little nest, of a deep but very round cup-shape, formed interlaced horsehair, so open and thin as to be seen through. It abundant in the orchard trees around Buenos Aires, but sometin may be seen pendent from maize-stalks. It is possessed of a n song, and breeds very late, indeed quite up to the beginning autumn. It lays three eggs in a clutch, of a pale bluish-gre mottled with small sepia blotches and spots, which, occurring m thickly in a central band, leave the ends somewhat free.

Meas.: axis 18 millim., diam. 13 millim.

35. PAROARIA CUCULLATA (Lath.).

♂. Buenos Aires, Arg. Rep., Dec. 5, 1881.

A tolerably common bird in the upper Riverine provinces; much kept as a cage-bird in Buenos Aires; as it has a very whistle, almost rivalling that of the English Blackbird in power, not in variety.

36. PAROARIA CAPITATA (Lafr. et d'Orb.).

♂. Argentine Republic, March 31, 1881.

The exact locality of this species is unknown to me, as I obtai it alive from a bird-fancier in Buenos Aires; but most probabl came from some part of the province of Corrientes.

37. CORYPHOSPINGUS CRISTATUS (Gm.).

♀. Oran, Salta, Arg. Rep., Nov. 15, 1880.

Iris sepia.

This bird was shot in an open country dotted with thickets of low brushwood, in which it skips about.

38. Poospiza assimilis, Cab. Mus. Hein. i. p. 137.

♂. Concepcion, Misiones, Arg. Rep., July 1, 1881.

Iris brick-red.

Abundant amongst the thick weeds and grass in the outskirts of the ruins of the Jesuit town, and often found in the same localities as the common *Zonotrichia pileata*, and, most likely in consequence of its similarity in appearance and habits, passed over by me many times, supposing it to be that bird.

[I have determined this bird, which Mr. White had taken for the nearly allied *P. thoracica*.—P. L. S.]

39. Poospiza torquata (Lafr. et d'Orb.).

♂. San Pedro, Santiago del Estero, Arg. Rep., Sept. 11, 1881.

I saw three or four of this species actively engaged in eating the young shoots of the algaroba tree.

40. Poospiza melanoleuca, Vieill.

♂. Oran, Salta, Arg. Rep., Nov. 3, 1880.
♀. „ „ Nov. 9, 1880.

Iris crimson.

This bird frequents the gardens in the vicinity of houses, where it vigorously pursues the ants amongst the branches of trees.

41. Poospiza erythrophrys, Scl. Ibis, 1881, p. 599, t. xvii. fig. 1.

♂. Rio Lujan, B. Aires, Arg. Rep., March 9, 1881.

Iris sepia.

I sent home a specimen of this bird, believing it to be *P. nigrorufa*; but Mr. Sclater declared it to be a new species, taking it for a type specimen, and describing it in 'The Ibis.' I obtained it on the Sierras of Totoral, Catamarca, a range which rises to the height of 3000 or 4000 feet above the sea-level, and is more or less densely wooded to near the summit; but since that time I have secured another specimen about 20 miles north of Buenos Aires, being the second I have yet seen.

42. Phrygilus gayi (Eyd. et Gerv.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 9, 1880.
♀. „ „ „ Sept. 14, 1880.

Iris brown.

Not uncommon round the outskirts of Andalgala; generally frequents the gardens and orchards.

43. Catamenia analis (Lafr. et d'Orb.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 14, 1880.

This bird was shot as it took refuge under the corridor of our house during a very severe snowstorm that lasted two days. The only specimen I have seen.

44. ZONOTRICHIA PILEATA (Bodd.).

♂. Rio Lujan, Buenos Aires, Arg. Rep., March 12, 1881.
♀. Punta Lara, Buenos Aires, Feb. 23, 1881.

A very common bird everywhere, and regarded in the Argentine Republic much as is the Sparrow in England. It builds its nest of grass and hair on the ground, and usually beneath a thistle or tuft of herbage. The egg is of a bluish-green ground, mottled equally all over, except at the pointed end, with rufous-brown spots. The clutch generally consists of three.

Meas.: axis 21 millim., diam. 16 millim.

45. COTURNICULUS MANIMBE (Licht.).

♂. Santo Tomé, Corrientes, Arg. Rep., May 16, 1881.

This specimen was obtained in low brushwood near the river Itacua, where it flew out of the long grass growing close to the water; it was the only one seen.

46. SALTATRICULA MULTICOLOR, Burm.

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 3, 1880.

Found on the trees, feeding on the insects in the flowers, and also on the seeds. The bird was wild, and uttered a piercing whistle on flying away.

47. EMBERNAGRA PLATENSIS (Gm.).

♂. Punta Lara, Buenos Aires, Arg. Rep., Feb. 21, 1881.
♂. Santo Tomé, Corrientes, Arg. Rep., May 14, 1881.
♀. Rio Lujan, Buenos Aires, Arg. Rep., March 9, 1881.

Iris brown.

Numbers of these birds were noticed settling on the highest spikes of grass or reeds in the neighbourhood of rivers or lagoons, away from woody shelter. They have a peculiar pitching jerky flight, and are usually seen in pairs. Their song is an agreeable trill.

48. CHRYSOMITRIS BARBATA (Mol.).

♂. Sierras de Totoral, Catamarca, Arg. Rep., July 29, 1880.
♂. Concepcion, Misiones, Arg. Rep., June 28, 1881.
♀. ,, ,, ,, ,, ,,

Iris dark.

This finch was secured in the thickest parts of the woods in the Sierras of Totoral, but is so scarce there that only one specimen could be obtained; in Santo Tomé, however, it occurred in large flocks amongst the woods near the river Uruguay, where, when startled, they fly up sharply and settle on the branches, uttering a very pretty chorus.

49. SYCALIS FLAVEOLA (Linn.).

♂. Monte Grande, Buenos Aires, Arg. Rep., Jan. 4, 1881.
♀. Flores, Buenos Aires, Arg. Rep., Jan. 27, 1881.

Iris sepia.

This pretty song-bird is exceedingly common around the houses in the suburbs of Buenos Aires.

The nest, when located in holes in the houses, is built of straw and twigs, but when in trees is usually lined with horsehair. The breeding-season extends from early spring to autumn; and the eggs, rather sharply pointed, are of a light green ground, mottled with brown spots; and the clutch consists of four.

Meas.: axis 19 millim., diam. 14 millim.

[I have not seen Mr. White's specimens; but they are probably *S. pelzelni*, mihi, Ibis, 1872, p. 42, if the species are distinct, as I believe is the case.—P. L. S.]

50. MOLOTHRUS BONARIENSIS (Gm.).

♂. Monte Grande, B. Aires, Arg. Rep., Dec. 31, 1880.
♀. „ „ „ Jan. 4, 1881.

The birds are common all over the Republic. It is usual for them to lay in the nests of other birds, such as *Troglodytes furvus*; indeed I have never known these lazy architects take the trouble to construct their own dwellings.

The number of eggs varies in different nests, as likewise their coloration. All, however, have a white ground; but some are dotted with large rufous-brown spots, whilst others are entirely devoid of them; but the typical shell is sprinkled over thickly with minute reddish-brown spots on a white ground.

Meas.: axis 24 millim., diam. 19 millim.

51. MOLOTHRUS RUFO-AXILLARIS, Cass.

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 2, 1880.
♀. City of Catamarca, Arg. Rep., Aug. 7, 1880.

Iris brown.

Rather common round the hedges and high trees by the side of alfalfa-fields in the neighbourhood of Andalgala, but by no means rare likewise in the province of Buenos Aires. In the spring of 1882 I obtained near Salto, Buenos Aires, its eggs, and found them laid in an old and large nest built of sticks by *Anumbius acuticaudatus*, high up in a Eucalyptus tree. The old birds kept near the nest, and, the moment any one approached, came close up to and around him, screeching. Four eggs in a clutch; the shell rather elongated, with pale green ground, streaked and spotted with dark sepia, thicker around the blunt end.

Meas.: axis 22 millim., diam. 16 millim.

52. AGELÆUS PHŒNICEUS (Linn.).

♂. Adrogué, Buenos Aires, Arg. Rep., Jan. 28, 1881.

Iris dark.

Of these birds I obtained two or three in a maize-field.

[This specimen requires examination. I have never seen *A. phœniceus* from anywhere so far south.—P. L. S.]

59. Cyanocorax cæruleus (Vieill.).

♂. San Javier, Arg. Rep., June 8, 1881.

This bird is found here at times in flocks, and makes a great deal of noise, but is exceedingly wild and difficult to shoot, so that I had to use ball-cartridge to secure this specimen.

60. Myiotheretes rufiventris (Vieill.).

♀. Monte Grande, Buenos Aires, Arg. Rep., Jan. 5, 1881.

Iris sepia.

As I was shooting Biscachas one evening I found this bird flying about their burrows.

61. Tænioptera nengeta (Linn.).

♂. San Javier, Misiones, Arg. Rep., June 7, 1881.

Iris crimson.

This Flycatcher is found on the open grass-lands scattered about amidst the dense woods of this district.

62. Tænioptera coronata (Vieill.).

♂. Flores, Buenos Aires, Arg. Rep., April 15, 1881.

Iris amber.

I have seen two or three specimens of this bird frequenting the scattered groves in the vicinity of Flores.

63. Tænioptera irupero (Vieill.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 6, 1880.
♀. ,, ,, ,, ,, Sept. 1, 1880.
♀. Concepcion, Misiones, Arg. Rep., June 21, 1881.

Iris dark sepia.

This bird was bagged in a vineyard; but it does not appear to be abundant at Andalgala, although in the scattered thorny woods of the sandy plains around San Pedro (Santiago del Estero), in Cordova, and other parts many are seen; and on one occasion I noticed a stray specimen as far south as the neighbourhood of Buenos Aires.

Rarely are two observed together, as they seem each to appropriate a plot of ground, and, if chased, return as soon as possible to that spot, of which they never lose sight. Perching on the top of a bush, they now and again dart to the ground for insects, or into the air for flies. I shot a pair on the outskirts of the cultivated ground, where they are usually found near houses; these were busy constructing a nest of twigs and horsehair in the lower part of an algaroba tree.

In Misiones the bird is rare.

64. Ochthœca leucophrys (d'Orb. et Lafr.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 1

During a violent snow-storm that lasted two days, this
several others, took refuge under the verandah of our
was captured by a boy. It is very rare.

65. Cybernetes yetapa (Vieill.).

♂ ♀. Itapua, Misiones, Arg. Rep., July 16, 1881.
Iris wood-brown.

Not far from the junction of the Saima with the Paran
birds were shot, in a large swamp.

They fly in pairs near the ground with a pitching motion,
on a long reed. Only one note was heard, uttered on the
as they were about to fly.

One or two specimens were observed near San Javier on t
guay. Their food I found to consist entirely of ants.

66. Sisopygis icterophrys (Vieill.).

♂. Flores, Buenos Aires, Arg. Rep., April 18, 1881.
♀. Punta Lara, Buenos Aires, Arg. Rep., Feb. 18, 1881.
Iris sepia.

Several of these birds were observed flying around a tree a
Lara; in fact they are by no means uncommon in the
of Buenos Aires.

67. Cnipolegus aterrimus, Kaup.

♂. San Javier, Misiones, Arg. Rep., June 7, 1881.
Iris crimson.

I shot this bird in the forest near the river Uruguay, whe
at Concepcion and San Javier, it was abundant.

68. Cnipolegus, sp. inc.

♀. Santo Tomé, Corrientes, Arg. Rep., May 14, 1881.
[The example examined is probably a female of *C. cyane*
or of a species very closely allied.—P. L. S.]

69. Lichenops perspicillatus (Gm.).

♂. Monte Grande, Buenos Aires, Arg. Rep., Jan. 5, 18
♀. ,, ,, ,, Jan. 2, 18
A common bird in the Argentine Republic.

70. Machetornis rixosa (Vieill.).

♂. Flores, Buenos Aires, Arg. Rep., April 8, 1881.
♀. ,, ,, ,, April 15, 1881.
♀. Salto, Buenos Aires, Arg. Rep., Oct. 10, 1881.
Iris dark.

This is common in the province of Buenos Aires. Du
month of October, in Salto, I took its eggs, which have a
ground, thickly studded with streaks and spots of a reddish
Four in a clutch.

Meas.: axis 24 millim., diam. 18 millim.

71. Centrites niger (Bodd.).

♂. San José de Flores, Buenos Aires, Arg. Rep., Aug. 2
♀. Salto, Buenos Aires, Arg. Rep., Oct. 12, 1881.
In Salto I saw two or three specimens, one male and

females, which I shot on the edge of a lagoon. In Flores a very wild specimen (the only one seen, in fact) was secured in the bañado or low swampy ground; it continued flying along and settling on the ground, but seemed disinclined to make for any shrubs, although some were near at hand.

The nest is found close to the edge of the lagoon, about half a yard above the water, and is built pendent from two or three rushes united; covered at the top, with the exception of a small circular entrance 1½ inch in diameter, placed at one side, and at times another small entrance near the bottom; it is constructed of roots of grass and rushes tightly cemented together, and beautifully lined with down. The external measurements of the nest are 4 inches in height and 3 in diameter.

The egg, which is of a deep bluish-green and spotless, has a peculiar squat form, the upper part truly hemispherical, the lower spheroidal. Three eggs in a clutch.

Meas.: axis 19 millim., diam. 16½ millim.

72. PLATYRHYNCHUS MYSTACEUS (Vieill.).

♀. San Javier, Misiones, Arg. Rep., June 7, 1881.

This bird was shot in the woods, and was the only specimen obtained.

73. EUSCARTHMUS GULARIS (Temm.).

♂. Santo Tomé, Corrientes, Arg. Rep., May 11, 1881.

A bird that is found in the thickest parts of hedges, on the outskirts of the town of Oran, and has a pretty warble. It is very difficult to see, and appears rather uncommon. It was likewise observed in Misiones, and with the same habits.

74. EUSCARTHMUS MARGARITACEIVENTER (d'Orb. et Lafr.).

♂. Oran, Salta, Arg. Rep., Nov. 15, 1880.

Abundant about the hedgerows in the vicinity of Oran.

75. CULICIVORA STENURA, Sw.

♂. Itapua, Misiones, Arg. Rep., July 18, 1881.

This pretty little bird is the only one of its species I have seen anywhere in the Republic. I shot it on marshy land near the river Saimá, some three miles off Itapua. As I was working my way through the marsh I heard a tiny creaking chirp, which I took to proceed from a cricket, but afterwards from a bird, although I could not see one; but on beating the grass, the chirp meanwhile receding, something flew up as it were a locust. I followed it with my eye, and marked it settle upon a small reed, where I shot it.

76. HAPALOCERCUS FLAVIVENTRIS (Lafr. et d'Orb).

♂. Rio Lujan, Buenos Aires, Arg. Rep., March 9, 1881.

♀. Punta Lara, Buenos Aires, Arg. Rep., Feb. 18, 1881.

Iris sepia.

82. Rhynchocyclus sulphurescens.

♂. San Javier, Misiones, Arg. Rep., June 6, 1881.

This specimen I secured in the dense and almost impenetrable forests.

83. Pitangus bellicosus (Vieill.).

♂. City of Catamarca, Arg. Rep., Aug. 6, 1880.

Very common over almost the whole of the Argentine Republic.

The nest, built in trees at no regular height, is rather large and very rough exteriorly, a foot in depth, eight inches in breadth, and constructed of wood, straw, and twigs; but the interior is beautifully lined with soft and downy feathers. Four eggs usually, but sometimes five, form the clutch: the rather elongate shell is of a parchment-coloured ground, rather thinly sprinkled towards the blunt end with dull blue and blackish spots, the latter predominating. It measures, axis 30 millim., diam. 23 millim.

84. Myiodynastes solitarius (Vieill.).

♀. Campo Santo, Salta, Arg. Rep., Nov. 29, 1880.

Shot in the thick forests, and apparently rare.

85. Hirundinea bellicosa (Vieill.); Sclater, Ibis, 1882, p. 164.

♂ ♀. Fuerte de Andalgala, Catamarca, Arg. Rep., Aug. 31, 1880.

Iris dark sepia.

This Flycatcher is by no means common. It is seen about the houses in pairs, but no more than one pair at a time at one dwelling, perched upon some projection, whence it darts off into the air at passing insects.

The snap of its beak, as it dashes at the flies, can be heard a long way off. Its cry is peculiar and piteous. There is no perceptible difference in plumage between the male and female.

86. Myiobius nævius (Bodd.).

♂. Flores, Buenos Aires, Arg. Rep., March 9, 1881.
♀. „ „ „ Nov. 19, 1881.

Iris brown.

These birds are very common in Buenos Aires; and I have met with them as far as the extreme northern limits of the Republic.

87. Pyrocephalus rubineus (Bodd.).

♂ ♀. Monte Grande, Buenos Aires, Arg. Rep., Dec. 31, 1880.

One of the most familiar birds in the province of Buenos Aires, which the natives call "Churincha," from one of the notes of its song, "chooréen," uttered when poised on the wing high up in the air; nor is its pretty trill confined to the hours of daylight, through the lonely stages of the night it frequently enlivens darkness like a Nightingale.

It builds usually in the orchards, in the fork of a tree. The

93. **PHYTOTOMA RUTILA**, Vieill.

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 21, 1880.
♀. „ „ „ „ Sept. 3, 1880.
♂, iris amber; ♀, iris purple.

The females are rather scarce and very difficult to see, as they are found singly and are careful to hide in the thickest parts of the hedges: their note was long mistaken by me for that of a cricket, so harsh and creaking is it. The males, however, at this season go in flocks, feeding upon the young shoots of the algarroba. Coloration of the sexes quite distinct.

94. **GEOSITTA TENUIROSTRIS** (Lafr. et d'Orb.).

♂. Salto, Buenos Aires, Arg. Rep., Oct. 17, 1881.
♀. „ „ „ „ Oct. 18, 1881.

These birds are very common in the open campos, running along the ground and then taking a low flight.

95. **FURNARIUS FIGULUS** (Licht.).

♂. San Pedro, Santiago del Estero, Arg. Rep., July 15, 1880.
♀. Salta, Arg. Rep., Oct. 23, 1880.
Iris brown.

This bird, met with in several parts of the Republic, makes a large nest of sticks, usually at a great height.

[I have never seen *F. figulus* from the Argentine Republic, and should doubt its occurrence there. The only *Furnarius* known to me from La Plata besides *F. rufus* is *F. tricolor*, Doering, of which I have a specimen from Cordova.—P. L. S.]

96. **FURNARIUS RUFUS** (Gm.).

♂ ♀. Monte Grande, Buenos Aires, Arg. Rep., Jan. 5, 1881.

A very familiar bird over the greater part of the Argentine territory. Its breeding-habits are very irregular, as in Misiones I remarked it constructing its mud nest in midwinter, although when I was in Salto, Buenos Aires, in October, the breeding-season appeared well advanced. An instance is known to me in which one nest was built on the top of another by a different pair of birds, thus forming a two-story house; but this is a very rare occurrence.

With Mr. Gibson's statement (Ibis, 1880, p. 17) that the nests of this bird are larger in the Banda Oriental than here, I do not agree. With regard to the position of the entrance, of fifteen nests observed personally at Salto, B. Aires, the entrance was on the left in eight cases, and on the right in seven. What, then, influences the feathery architect in selecting its position will probably remain a mystery.

The locality chosen for the nest is usually the fork of a tree, or a post, or the projecting cornice of a house. It is very solid and strong, being made of cemented mud from 1·5 to 2·5 inches thick: one that I took at haphazard weighed 14 lb.

In Salto I watched the operation of building. The pair began the work on Sunday, Oct. 9, 1881, but did little the first day just trace out the foundation, as there was no mud obtainabl they had to resort to water-tubs to form it; but on Monday m it poured for about six to eight hours, during which time the did not work. When the rain ceased, however, they began in earnest, having plenty of material at hand.

They generally took it in turns to build, one of them alwa maining inside doing the masonry, whilst the other brought mud; but at times both became masons and labourers. On T afternoon the nest was half built; but on Wednesday progress lax, as the soil was drying up.

On Thursday the hemispherical walls rose all round to the of the bird, except where the entrance was to be; and the inside tect had thenceforward to stretch its neck and stand on tip complete the cupola, which it did in the direction of the en In the construction of the roof much horsehair was mixe the mud to strengthen it.

On Saturday the roof was well advanced; and now they comm to insert the internal curved partition which, fronting the ent hinders a view of, and forms a passage into, the interior.

This was a labour that occupied considerable time; but on S the 16th it rained again heavily, and thus lightened the toil industrious builders.

On the Tuesday following the partition was finished, and i remained to close up the entrance to the required height small section of roofing. This done, the dwelling was comple Wednesday the 19th; and then but a short time was occup lining the inside with fine dry grass, and the whole was rea occupation. The Oven-bird seems to lay only three eggs; bu one nest I once took four chicks; whilst I have found as m three other species of bird's eggs laid amongst those of *F. ru*

The egg is milk-white and perfectly spotless.

Meas.: axis 28 millim., diam. 21 millim.

97. Upucerthia luscinia (Burm.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 2,
♀. ,, ,, ,, ,, Sept. 1,
Iris sepia.

Found about the hedges. Every time it springs from one another it utters a sharp jerky whistle.

98. Cinclodes fuscus (Vieill.).

♀. Pucará, Catamarca, Arg. Rep., Aug. 25, 1880.

In the rocky quebrada (ravine) of Pucará, 7500 feet abo level, I met with this bird hopping from stone to stone in the in pursuit of insects, and at times it ran right into the water.

99. Sclerurus caudacutus (Vieill.).

♂. San Javier, Misiones, Arg. Rep., June 2, 1881.
Iris dark.

Only two of these birds were observed during my trip through Misiones. It frequents the dense gloomy forests, where it busies itself in scraping amongst the dead leaves; and although it may be close at hand and the rustling distinct, a quick eye is required to detect it, as its plumage is of the exact colour of decaying foliage. If startled, it flies up onto the trunk of the nearest tree, and there remains perfectly motionless in an upright position. I never heard it utter a single note.

100. LEPTASTHENURA ÆGITHALOIDES (Kittl.).

♀. City of Catamarca, Arg. Rep., Aug. 6, 1880.
Iris light sepia.
Not uncommon in the well-wooded gardens around the town.

101. LEPTASTHENURA FULIGINICEPS (Lafr. et d'Orb.).

♀. Sierras de Totoral, Catamarca, Arg. Rep., July 24, 1980.
Iris light brown.

I found this bird principally on the slopes of the hills, outside the dense woods; but it is not abundant. It has a note something similar to that of the Wren.

102. SYNALLAXIS RUFICAPILLA (Vieill.).

♂. Monte Grande, B. Aires, Arg. Rep., Jan. 2, 1881.
Two or three were seen in the tala woods.

[I have not seen Mr. White's specimens, and should rather doubt their belonging to the true *S. ruficapilla*.—P. L. S.]

103. SYNALLAXIS FRONTALIS, Pelz.

♂. Oran, Salta, Arg. Rep., Nov. 12, 1880.
♀. Sierras de Totoral, Catamarca, Arg. Rep., July 29, 1880.

In the upper provinces of the Argentine Republic this bird is not unfrequently met with.

104. SYNALLAXIS ALBESCENS, Temm.

♀. San Javier, Misiones, Arg. Rep., June 8, 1881.
Not unfrequently met with in the woods of Misiones.

105. SYNALLAXIS PHRYGANOPHILA, Vieill.

♂. Punta Lara, B. Aires, Arg. Rep., Feb. 18, 1881.
Iris reddish brown.

This was the only specimen seen, and was shot in the dense tala woods along the shores of the La Plata.

106. SYNALLAXIS WHITII, Sclater, Ibis, 1881, p. 600, t. xvii. fig. 2.

♂. Oran, Salta, Arg. Rep., Nov. 9, 1880.

This new species must be rare, as I only succeeded in obtaining one specimen near Oran.

107. **ANUMBIUS ACUTICAUDATUS**, Less.

♂. Salto, B. Aires, Arg. Rep., Oct. 8, 1881.
♂. Flores, B. Aires, Arg. Rep., March 31, 1881.
♀. „ „ „ Aug. 26, 1881.
Iris dark red.

I have shot this bird in June in Misiones, where it is not un common. In Salto (B. Aires), however, it is very numerous abo the plantations on the Estancias, where it builds in the forks of hig trees, usually the Eucalyptus. The nest is constructed of lar twigs, and is a fine structure for the size of the bird, 21 inch in height and 48 in circumference, in fact twice as great that of *Milvago chimango*. The entrance to the nest, which is ne the top, but is not right on it, and is about four or five inches diameter and neatly rounded, leads downwards by a steeply inclin spiral passage to the bottom. The whole is thickly lined insi with hair, feathers, and wool, making a very soft, downy, and pret nest, and one that is very difficult to pull to pieces, as the twi are mostly thorny and strongly interlaced.

There were five eggs in the one I took: their shape is elongate considerably pointed at one end, and pure white, without spot the only one to which it can be compared is that of *Columbula picu* but it is more acutely pointed.

Meas.: axis 24 millim., diam. 17 millim.

108. **PHACELLODOMUS FRONTALIS** (Licht.).

♂. Punta Lara, B. Aires, Arg. Rep., Feb. 18, 1881.
♀. „ „ „ Feb. 21, 1881.
Iris yellow.

This bird keeps well out of sight amongst the thickest bus undergrowth of the woods, and makes a very peculiar chatteri sound that appears to attract other birds around it, especially t "Chingolo" (*Zonotrichia pileata*), which I have noticed crowdi round it in great numbers and in a very excited state—a fact th has forced itself on my observation many times and in several d ferent localities.

109. **PHACELLODOMUS SIBILATRIX**, Scl. P. Z. S. 1879, p. 461.

♂. Monte Grande, Buenos Aires, Arg. Rep., Jan. 7, 1881.

I observed two or three of these birds in a tala thicket at Mo Grande.

110. **HOMORUS UNIRUFUS** (Lafr. et d'Orb.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 16, 188
Iris light yellow.

These birds are found usually in the open, where there are la algarroba-trees dotted about.

They are seen in pairs, and utter, with crest erect, and in conce a succession of peculiar hoarse and varied notes. Their very bul nests are constructed of large twigs, placed high up in lofty trees.

111. **Anabazenops rufo-superciliatus** (Lafr.).

♂. Sierras de Totoral, Catamarca, Arg. Rep., July 26, 1880. Iris light brown.

A very wild bird, and exceedingly scarce on this well-wooded mountain-range, but occasionally seen amongst the brushwood in damp places on the hill-side.

112. **Sittasomus olivaceus** (Max.).

♂. Campo Santo, Salta, Arg. Rep., Nov. 29, 1880.

♀. Campo Colorado, Oran, Salta, Arg. Rep., Nov. 4, 1880.

Observed, but not abundantly, in the magnificent gloomy forests of Campo Colorado, yet very difficult to distinguish, being of the same hue as the trunks up which they run.

113. **Glyphorhynchus cuneatus** (Licht.).

♂. Concepcion, Misiones, Arg. Rep., June 27, 1881. Iris dark.

Not uncommon in the thick woods, as also in the extensive orange-groves around the old Jesuit ruins.

114. **Dendrocolaptes picumnus** (Licht.).

♀. Concepcion, Misiones, Arg. Rep., June 21, 1881.

Shot in the thickest parts of woods near the river, climbing up the trees, around which it turned in corkscrew fashion; but does not seem common.

115. **Drymornis bridgesi** (Eyton).

♀. Pilciao near Andalgala, Catamarca, Arg. Rep., Sept. 17, 1880. Iris brown.

The cry of this bird is much the same as that of a Woodpecker, and it clings to the algarroba trees in a similar way; but in the afternoon it is seen scattered about on the sandy ground in the pursuit of insects. I have observed it in the northern provinces of the Republic, perhaps as far south as Cordova, although in one instance, in the month of February, a friend of mine obtained a single specimen at Monte Grande, in the vicinity of Buenos Aires. Not in one solitary instance, however, have I met with the bird to the eastward, in Corrientes or Misiones.

[Mr. White calls this species *Nasica longirostris*; but I have little doubt it is *Drymornis bridgesi*, of which I have skins from Mendoza, and Gualeguaychu, in Entrerios. *Nasica* is from Guiana and Amazonis, and does not occur so far south.—P. L. S.]

116. **Xiphocolaptes albicollis** (Vieill.).

♀. San Javier, Misiones, Arg. Rep., June 7, 1881.

117. **Xiphocolaptes major** (Vieill.).

♂ ♀. Campo Colorado, Oran, Salta, Arg. Rep., Nov. 4, 1880. Iris crimson.

Common here in the dense forest, where their continued hard pecking at the lofty tree-trunks is very accentuated. Two or three it at once penetrates by successive hops into the dense shade. I have never observed its flight.

125. **Oreotrochilus leucopleurus**, Gould.

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 25, 1880.

I only obtained one specimen, as it was feeding on the flowers of the Idiondilla (*Cestrum pseudoguina*).

126. **Sparganura sappho** (Less.).

♂ ♀. City of Catamarca, Arg. Rep., Aug. 12, 1880.

Iris dark.

I have met with these Humming-birds scattered, although somewhat sparsely, over the upper provinces of the Republic, feeding principally upon *Nicotiana glauca*, the Quichua name for which is "palan-palan." They follow it southwards as it flowers, even as far as Cordoba; but their true habitat is the Andean region. In Quichua, Humming-birds generally are called "Tuminicos." When these are poised in front of a flower with wings and tail expanded in the full sunshine, they offer the most brilliant feathery picture imaginable; and as they dart off their flight is so speedy that the eye cannot follow.

127. **Patagona gigas** (Vieill.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 15, 1880.
♀. " " " " Sept. 29, 1880.

This magnificent bird, which the natives say they have never seen before at Andalgala, was shot on the "palan-palan," the usual plant that it frequents at this season. It appeared here just after a two days' severe snow-storm, so that in all probability it had been driven down hither by it.

It is exceedingly powerful on the wing, and flutters in front of a flower, sipping the nectar, exactly as the smaller species of this family. They have a most peculiar, zig-zag, jerky flight, which, when making a long detour for any particular spot, becomes undulating.

They are without doubt partially insect-eaters, as I have not only observed their crops full of flies and small beetles, but have also seen them pursue and catch them in the air, with the motions of a Flycatcher.

They perch on some bare branch of a plant, which they entirely appropriate, driving off every other bird that dares to approach, and every now and then visit all its flowers to sip the sweets. The large humble-bees, however, cause them some trouble, as they likewise [illegible] ted to sipping nectar; these the *P. gigas* attacks with all its force, and by fluttering its wings, rushing at, pushing and pecking them, succeeds in ridding the spot of their presence.

The note of this bird is similar to the chirp of a young Sparrow, but much stronger.

These birds, like animals generally in the Argentine Republic, take no notice of a person mounted, but instantly disappear when a foot-passenger approaches; so that as I was on muleback I was enabled to ride close up to and observe them.

132. CAMPEPHILUS BOIÆI (Wagl.).

♂. Pilciao, Andalgala, Catamarca, Arg. Rep., Sept. 16, 1880.
♀. Campo Colorado, Oran, Salta, Arg. Rep., Nov. 4, 1880.
Iris light yellow.

As I was out on muleback at Pilciao chasing the *Chunga burmeisteri*, on passing an algarroba-tree I chanced to observe this beautiful bird, which revealed itself by its vigorous pecking; it seems to be rare in that locality. I likewise obtained it at Campo Colorado, in the midst of the dense forest, but clear of undergrowth. Its cry, or rather croak, is peculiarly strong. The ♀ has more black on the head than the ♂.

133. DRYOCOPUS ERYTHROPS (Val.).

♂. San Javier, Misiones, Arg. Rep., June 8, 1881.

Only a few specimens observed, and they only in the dense forests.

134. PICUS MIXTUS, Bodd.

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 2, 1880.
Iris sepia.

I shot a pair of these Woodpeckers on some old posts in the midst of a very dense hedge; one skin, however, was unfortunately spoilt.

135. PICUS CACTORUM, Lafr. et d'Orb.

♂ ♀. City of Catamarca, Arg. Rep., Aug. 7, 1880.
Iris brown.

I found these tolerably abundant in the province of Catamarca, where three or four are usually observed together on a large cactus, but on being disturbed either take to another cactus or to the lofty branches of algarroba trees.

136. CHLORONERPES AFFINIS (Wagl.).

♂ ♀. Campo Santo, Salta, Arg. Rep., Nov. 29, 1880.
Iris crimson.

Does not seem uncommon about these parts.

[I have not seen Mr. White's skins referred to this species — P. L. S.]

137. CHLORONERPES AURULENTUS (Licht.).

♂. San Javier, Misiones, Arg. Rep., June 8, 1881.
♀. Concepcion, Misiones, Arg. Rep., June 23, 1881.

This bird, unusually met with in Concepcion, is common in San Javier, only a distance of ten leagues further north. It is seen singly in dead high trees, and makes a tapping so loud, and heard at such a distance, as to cause me to imagine it proceeded from one of the larger species.

[I have not seen Mr. White's skins; but Azara includes a Woodpecker (his no. 257) which is referred by Hartlaub (Ind. Az. p. 16) and Cab. et Hein. (Mus. Hein. *Scansores*, p. 158) to this species.— P. L. S.]

142. TROGON SURUCURA, Vieill.

♀. Concepcion, Misiones, Arg. Rep., June 21, 1881.
Iris dark.

Although for several days I stalked these birds, hearing their call, yet I could only manage to secure one specimen in the dense forest.

143. CROTOPHAGA ANI, Linn.

♂. Oran, Salta, Arg. Rep., Nov. 9, 1880.
♀. „ „ „ Nov. 18, 1880.
Iris sepia.

This bird flies in flocks, and is usually observed in close juxtaposition with a flock of the *Guira piririgua* in the open country on the outskirts of the cultivated ground, where it perches on bush or hedges.

144. GUIRA PIRIRIGUA (Vieill.).

♂. Flores, Buenos Aires, Arg. Rep., April 8, 1881.
♀. Salto, Buenos Aires, Arg. Rep., Oct. 8, 1881.
Iris deep orange.

The native name of this noisy bird is "Uraca;" and it is found abundantly all over the Republic, commonly flying in flocks of six or seven. Here, in a willow tree, a nest was discovered, built of twigs, containing seven eggs, which was quite open above, with a very deep basin, and was lined with dry leaves, principally of the "Eucalyptus;" but in other provinces different leaves are employed. The Uracas are sometimes tamed and kept in houses to rid them of insects; but their noise and dirty habits disqualify them for occupying the position of favourites.

The egg is of an oblate spheroidal form, equally blunted at both ends, with a slightly raised white chalky network equally diffused over a pale green ground.

Meas.: axis 42 millim., diam. 32 millim.

145. PIAYA CAYANA (Linn.).

♂ ♀. Concepcion, Misiones, Arg. Rep., June 21, 1881.
Iris crimson.

I found this tame bird rather rare round here, but usually met with it in the dense woods, where, on account of the slowness of its movements, it was easy to shoot, although difficult to distinguish.

Very seldom seen in flight, it hops trom twig to twig, using its fine tail at the end of the leap to steady its perch.

146. COCCYZUS MINOR (Gm.).

♂. Salto, Buenos Aires, Arg. Rep., Oct. 17, 1881.
Iris dark.

Not uncommon in the province of Buenos Aires, especially about Monte Grande; but in other parts of the Republic I do not remember often having met with it. Its nest is built in low trees or hedges, much resembling that of the Dove in outward appearance,

but lined inside with soft dry grass. The eggs, of wh
two in a clutch, rather squat and blunted at both e
uniformly dull pale green, without spots or markings o

Meas.: axis 31 millim., diam. 24 millim.

[I suspect the Cuckoo referred to is *C. melanocoryph*
C. minor does not (to my knowledge) occur nearly so
P. L. S.]

147. Coccyzus cinereus (Vieill.).

♂. Flores, Buenos Aires, Arg. Rep., Jan. 24, 1882
Iris crimson.

I observed but two or three in the copses round Flo

148. Rhamphastos toco (Gm.).

♂. Campo Colorado, Oran, Salta, Arg. Rep., Nov.
Iris olive-green.

This Toucan I shot among the lofty forest-tree
generally in flocks; and their flight is extremely sw
straight line.

They are wild, and by no means plentiful in this nei
but in Misiones I likewise met with them in greate
where they, in company with the Parrots, commit d
amongst the orange-groves.

149. Conurus patagonus (Vieill.).

♂. Guazan, near Andalgala, Catamarca, Arg. Rep.,
♀. Andalgala, Catamarca, Arg. Rep., Sept. 6, 188
Iris white.

At Guazan this Parrot is found in large flocks, and s
on bare trees. By the natives it is called "Loro Bar
it builds its nest in holes in the barrancas or cliffs.
shot of a flock flying over, the rest will continue to wh
spot long enough to give the sportsman time to kill near
and at every shot, as the victims tumble, the rest r
screams, so that the noise, always great, becomes at len

At Cosquin, in the neighbourhood of Cordoba, I ha
tunity of observing them. They are extremely abunda
the sierras there, and are very destructive to crops.

On each patch of ground sown with wheat or m
stationed as a scarecrow; and the shouts of these, the
of the valley, some leagues, almost rival in intensit
chorus.

The warfare between the birds and their tormentor
invariably in favour of the former, as they have a ha
unseen to the bottom of the stems, which they bite thr
the stalk falls and they consume the grain at leisure.

In the winter, fallen fruit-kernels of the woods aff
tenance. They breed in deep holes on the cliff-faces; an
to sack their nests is very hazardous. Four or five eg
found in a clutch. The young birds form a tasty dish

150. CONURUS ACUTICAUDATUS (Vieill.).

♂ ♀. Guazan near Andalgala, Catamarca, Arg. Rep., Sept. 5, 1880.

Iris amber.

This species is not very abundant here, but flies very swiftly in flocks of seven or eight, screeching continually when on the wing. I shot my specimens out of a number perching on a tala tree as they were devouring the young shoots.

151. CONURUS MOLINÆ, Souancé.

♂. Campo Colorado, Oran, Salta, Arg. Rep., Nov. 4, 1880.

Iris brown.

A very pretty little Parrakeet, which is met with in dense forests in flocks of about twenty, their flight being limited, for the most part, to the clear aisles beneath the branches.

[I have one of Mr. White's examples of the Parrot which he has named *C. vittatus*. It agrees quite well with skins of *C. molinæ* in my collection, obtained by Natterer in Mato-Grosso, and by Bridges in Bolivia.—P. L. S.]

152. BOLBORHYNCHUS MONACHUS (Bodd.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 6, 1880.

♀. San Pedro, Santiago del Estero, Arg. Rep., July 15, 1880.

Iris light brown.

At San Pedro these birds seem very abundant, as many of their capacious nests, built of twigs, and in which they appear to roost, are observed in the algarroba trees around. They fly in large flocks. At Andalgala, however, they seem rare.

153. CHRYSOTIS VINACEA (Max.).

♂. Concepcion, Misiones, Arg. Rep., June 20, 1881.

♀. „ „ „ June 27, 1881.

Iris crimson.

Both in Concepcion and San Javier these Parrots are found in incredible numbers feeding in the orange-groves which cover and enclose the extensive Jesuit ruins in those parts of Misiones. They seem to be very voracious, as they feed all day long; and the inhabitants shoot them for food: but they are not easily scared; for on hearing a shot, they only fly up in clouds to descend again, meanwhile making the air resound with their shrill cries. They can be taught to talk tolerably well if taken young.

Their breeding-time is December.

154. CHRYSOTIS AMAZONICA (Linn.).

♀. Itapua, Misiones, Arg. Rep., Aug. 6, 1881.

Iris crimson.

Although not very common here, this species is found abundantly in the upper provinces of this Republic, especially Catamarca and Tucuman, as well as in Paraguay.

On its morning and evening passages to and from the sierras

flies very high, in large flocks extended in line. When on t
it utters a distinct articulate vocal sound, which has led
cultivate this capacity to a high degree.

The variation in colouring is found to be great both in pr
and situation, the head sometimes being of a uniform yellow

155. PIONUS MAXIMILIANI (Kuhl).

♂. Rio Vermejo, Oran, Salta, Arg. Rep., Nov. 10, 1880
Iris brown.

Only one specimen seen, perching on one of the topmost
of a high tree in the dense forest on the banks of the Verm

156. STRIX FLAMMEA (Linn.).

♂. Concepcion, Misiones, Arg. Rep., June 20, 1881.
Iris dark.

These Owls are commonly met with all over the Republi
shot this, the only one seen here, amongst the ruins of the o
town.

157. ASIO BRACHYOTUS (Forst.).

♂. Monte Grande, Buenos Aires, Arg. Rep., March 1,
Iris light yellow.

These Owls are very common all over the campos of t
vince of Buenos Aires, where they make night hideous
hooting.

158. PHOLEOPTYNX CUNICULARIA (Mol.).

♂. Salto, Buenos Aires, Arg. Rep., Oct. 10, 1881.
♀. Pilciao, Andalgala, Catamarca, Arg. Rep., Sept. 17,
♀. Concepcion, Misiones, Arg. Rep., June 22, 1881.
Iris light yellow.

In Misiones this bird exceeds in size and differs in col
that of the campos of Buenos Aires, as the black soil of the
differs from the red clay of Misiones. I saw two or thr
upon the open undulating grass-lands here; but they are g
observed perched upon an ant-hill, beneath which they bur
nest, as no friendly Biscacha is here present to offer them an
The rather rough nest, situated in a burrow about three
length, but which descends not more than two below the su
composed of dry hemlock and sticks, without any downy
The eggs, of which there are usually four in a clutch,
spotless milky white and bluntly rounded at both ends.
measure, axis 34 millim., diam. 26 millim.

159. BUTEO PTEROCLES (Temm.).

♂ ♀. Monte Grande, Buenos Aires, Arg. Rep., April 13
Iris dark brown.

I have observed four or five or this species at Monte Gra
in no other part of the Republic.

160. GERANOSPIZA CÆRULESCENS (Vieill.).

♂. Campo Colorado, Oran, Salta, Arg. Rep., Nov. 4, 1880.

Iris yellow.

I shot this pretty Falcon whilst perched motionless on a low branch of a tree in the dense forest.

It was the only one of the species. I had hitherto seen; but subsequently I met with one on the Upper Uruguay.

161. TINNUNCULUS SPARVERIUS (Linn.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 9, 1880.

♀. Pilciao, Andalgala, Catamarca, Arg. Rep., Sept. 16, 1880.

Iris brown.

I have met with this Sparrow-hawk in many parts of the Republic. Its flight is limited from clump to clump of trees, perching usually on bare or dead branches.

[Probably *T. cinnamominus* for those who accept this subspecies. *Cf.* Gurney, Ibis, 1881, p. 554.—P. L. S.]

162. ELANUS LEUCURUS (Vieill.).

♂ ♀. Monte Grande, Buenos Aires, Arg. Rep., Dec. 31, 1880.

Iris yellow.

This White Hawk was shot as it was flying about close to the Estancia house of Monte Grande; but I have not noticed it in any other parts of this province, although subsequently two or three other pairs have been observed about the same locality. It was nesting in some lofty trees.

The eggs are very similar to those of *Milvago chimango*.

163. SPIZIAPTERYX CIRCUMCINCTUS (Kaup).

♀. Guazan, Andalgala, Catamarca, Arg. Rep., Sept. 5, 1880.

Iris amber.

A rare bird in this neighbourhood, as this was the only specimen seen.

164. MILVAGO CHIMANGO (Vieill.).

♂. Salto, Buenos Aires, Arg. Rep., Oct. 14, 1881.

♀. Punta Lara, Buenos Aires, Arg. Rep., Feb. 19, 1881.

Iris brown.

In the forks of trees, frequently of the Eucalyptus, this bird builds its open nest of twigs, lined with grass; but the structure is by no means large for the size of the bird. The Chimango is very destructive to house-pigeons on an Estancia. The breeding-season commences early in October. The eggs, of which there are three in a clutch, are rounded and of a rufous-brown ground sprinkled with flakes and spots of the same, but much darker, tint.

Meas.: axis 42 mill., diam. 34 mill.

Legs and feet of a dirty yellow, and base of beak the same.

165. **Cathartes aura** (Linn.).

♂. Concepcion, Misiones, Arg. Rep., June 27, 1881.
Iris dark.

This Vulture is abundant in these parts.

166. **Cathartes urubitinga**, Pelzeln.

♀. Sierras de Totoral, Catamarca, Arg. Rep., July 30,

This Black Vulture was shot at an elevation of 4500 f the sea-level. Native name for all this genus is either Jote, according to locality.

[Is not *C. atratus* the species intended here?—P. L. S.]

167. **Phalacrocorax brasilianus** (Gm.).

♂. Salto, Buenos Aires, Arg. Rep., Oct. 10, 1881.
Iris dark blue.

This species is found plentifully all over the country streams and rivers.

168. **Ardea egretta** (Gm.).

♂. Punta Lara, B. Aires, Arg. Rep., Feb. 19, 1881.
♀. Oran, Salta, Arg. Rep., Nov. 15, 1880.
Iris white.

This Egret, whose native name is "Mira-sol," is met wit the Republic, especially on the river Paraná.

169. **Ardea candidissima** (Gm.).

♀. Bañado de Flores, B. Aires, Arg. Rep., April 20, 1

Found in abundance throughout the province of Buen by the sides of streams and lagoons.

The egg, equally blunted at both ends, is of a flesh- ground, with at times a few tiny rufous-brown spots indiscriminately over its surface.

Meas.: axis 36 mill., diam. 27 mill.

170. **Ardea sibilatrix** (Temm.).

♂. Oran, Salta, Arg. Rep., Nov. 13, 1880.
Iris pale blue.

This was the only one of this species seen during my so Oran.

171. **Tigrisoma brasiliense** (Linn.).

♀. City of Corrientes, Arg. Rep., Aug. 10, 1881.

This handsome bird was shot on the river Paraná, Corrientes; and no other specimen was observed.

172. **Nycticorax gardeni** (Gm.).

♂. Pacheco, Buenos Aires, Arg. Rep., March 12, 1881
♀. Sauce Redondo, Salta, Arg. Rep., Oct. 17, 1880.
Iris yellow.

Close by the extensive swamps around Sauce Redondo, about half a dozen of these birds perched upon a tree; and after shooting one, the rest merely flew round and alighted upon another close by. Not uncommon, moreover, as far south as Buenos Aires.

173. Falcinellus igneus (Gm.)?

♀. Punta Lara, Buenos Aires, Arg. Rep., Feb. 21, 1881.
Iris sepia.

The Glossy-winged Ibis is common in the lagoons and swamps over most of the Republic, especially in the province of Buenos Aires, where it is met with in large flocks.

174. Chauna chavaria (Linn.).

♀. Punta Lara, B. Aires, Arg. Rep., Feb. 21, 1881.
Iris brown.

The Crested Screamers, whose native name is Chajá, fly in pairs, and frequently circle in the air to an enormous bright. Their usual haunt is around swamps and lagoons.

175. Dendrocygna fulva (Gm.).

♂ ♀. Salto, Buenos Aires, Arg. Rep., Oct. 12, 1881.
Iris dark brown.

This Duck was shot out of a flock of fifteen which rose from a lagoon; and attached to its feet were found two leeches.

176. Cairina moschata (Linn.).

♀. Campo Colorado, Oran, Salta, Arg. Exp., Nov. 4, 1880.
Iris brown.

The only specimen seen here; and that was shot in a pool of stagnant water in the sandy river-bed; but the bird was afterwards found not uncommonly further north.

177. Querquedula cyanoptera (Vieill).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 25, 1880.
Iris orange.

This beautiful Duck was the victim of a boy's skill with the bolas, and was brought to me wounded; it is, however, widespread throughout the Republlc.

178. Spatula platalea (Vieill.).

♀. Salto, Buenos Aires, Arg. Rep., Oct. 12, 1881.
Iris dark.

Not uncommon in this neighbourhood.

179. Metopiana peposaca (Vieill.).

♂. Salto, Buenos Aires, Arg. Rep., Oct. 17, 1881.
♀. „ „ „ „ Oct. 12, 1881.
Iris crimson.

Several of these birds were found in the streams and lagoons.

Legs of deep yellow, beak slightly lighter in tint; wattl
base of the beak a deep orange-red.

180. Columba maculosa, Temm.

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Sept. 5
Iris white.

I found this elegant Pigeon flying in flocks in the
(paddocks) and alfalfares, where they were feeding on th
alfalfa (Lucerne) shoots, as evidenced by their crops, wh
full of them.

181. Zenaida maculata (Vieill.).

♂. Fuerte de Andalgala, Catamarca, Arg. Rep., Aug. 2
♀. Monte Grande, Buenos Aires, Arg. Rep., Jan.
(immature).
Iris sepia.

I saw great numbers in the vineyards and Lucerne
Andalgala; but they are common likewise in the province o
Aires.

The nest, very shallow, is usually built in the fork of a
constructed of twigs, but so thin that the eggs can be
through the sides.

Two eggs in a clutch, and of a pure spotless white.
Meas.: axis 28 mill., diam. 21·5 mill.

182. Columbula picui (Temm.).

♂ ♀. Flores, Buenos Aires, Arg. Rep., Feb. 2, 1881.
Iris lilac.

Met with commonly all over the Republic. Nest built of
the forks of trees. Eggs of a pure spotless white, and two in
Meas.: axis 52 mill., diam. 17 mill.

183. Chamæpelia talpacoti (Temm.).

♂. Oran, Salta, Arg. Rep., Nov. 9, 1880.
♀. " " " Nov. 13, 1880.
Iris crimson.

These pretty chocolate-coloured Doves fly in pairs, and
date were found constructing their nests in the orange-grov
are sometimes seen on the ground busily in quest of seeds,
very wild and not at all common. I shot specimens at Cor
Misiones, in the month of June; but they were rare there.

184. Leptoptila megalura, Scl. & Salv. P. Z. S. 1879, p

♂. Oran, Salta, Arg. Rep., Nov. 18, 1880.
♀. Guazan, Andalgala, Catamarca, Arg. Rep., Sept. 5,

This pretty Pigeon, whose habitat is chiefly mountainous
is not very abundant at Guazan (4000 feet above sea-lev
when flying makes a peculiar fine metallic whirring with its

Its flight is very limited and close to the ground; it rarel on a tree. It is very wild, and as it runs swiftly amongst the brushwood is difficult to shoot. At Oran, where, however, they are by no means plentiful, I shot them in an orange-grove.

185. Penelope pileata, Wagl.

♂. Sierras de Totoral, Catamarca, Arg. Rep., July 30, 1880.
Iris brown.

Very common in Oran and the Gran Chaco, and met with as far south as the sierras of Totoral. Four or five are usually found together on the same tree, in the midst of the densest forests, where they seek the highest branches. Their notes, which are extremely deceptive as to distance, consist of very harsh, deafening, grating, metallic sounds, resembling the creaking of an ungreased double-handed saw through a block of hard timber. On these birds I had to rely chiefly for food on my travels in the north of the Republic; and when young they make no despisable dish; but when old their flesh is too tough to masticate, though it does well for soup.

186. Ortalida guttata (Spix).

♂. Sauce Redondo, Salta, Arg. Rep., Oct. 17, 1880.
Iris sepia.

These Guans are abundant in the forests of the north of the Republic.

187. Gallinula galeata (Licht.).

♂. Salto, Buenos Aires, Arg. Rep., Oct. 17, 1881.
Iris reddish-brown.

Abundant on the lagoons in the province of Buenos Aires. Wattle at the base of the beak a deep orange-colour, and legs slaty green.

188. Parra jacana (Linn.).

♂. Buenos Aires, Arg. Rep., Nov. 1, 1881.

A rare bird in Buenos Aires, but common in the north of the Republic, especially on the swampy plains of Tucuman.

189. Vanellus cayennensis (Gm.).

♂. Rio Lujan, Buenos Aires, Arg. Rep., March 7, 1881.
♀. Salto, Buenos Aires, Arg. Rep., Oct. 18, 1881.
Iris crimson.

This Plover, whose native name is "Teru-Tero," is very common all over the camps of the province of Buenos Aires, but at the same time found throughout the Republic; and in the breeding-season, which is now (October) at its height, annoys the sportsman by its shrill screeching cry, by circling round his head, and by shamming wounded, in order to attract his attention. Its nest is carefully concealed in the grass, and consists of a mere shallow hollow; but it may be easily discovered when sheep are driven over the land, as then the bird may be seen standing in front of its nest, and flapping its wings violently to make the bidents part and pass on either

side. The clutch consists of three eggs; and a remarkable
stance in connexion with them is, that when they become he
young all their points are directed inwards to a common cen

The eggs, of a very elongated pear-shaped form, have a g
a warm stone-colour, sprinkled over with jet-black spots
cluster somewhat thickly round the blunt end.

Meas.: axis 50 mill., diam. 36 mill.

The eggs form a favourite dish with the natives, and
delicate.

190. **Charadrius virginicus**, Borkh.

♀. Punta Lara, Buenos Aires, Arg. Rep., Feb. 22, 188
Iris dark.

Common in the province of Buenos Aires.

191. **Ægialitis collaris** (Vieill.).

♀. Punta Lara, Buenos Aires, Arg. Rep., Feb. 18, 188
Iris sepia.

This bird seems rather rare.

192. **Himantopus brasiliensis**, Brehm.

♀. Punta Lara, Buenos Aires, Arg. Rep., Feb. 23, 188
Iris crimson.

Met with in flocks abundantly about the lagoons of Buen

193. **Gambetta melanoleuca** (Gm.).

♂. Pacheco, Buenos Aires, Arg. Rep., March 15, 1881.
Shot in the extensive swamps here.

194. **Rhynchops nigra**, *Linn.*

♀. Monte Grande, Buenos Aires, Arg. Rep., Feb. 4, 1
Iris brown.

This bird is by no means common in Buenos Aires; but a
seen skimming along the surface of a lagoon at excessive sp

195. **Sterna superciliaris**, Vieill.

♀. Itapua, Misiones, Arg. Rep., July 18, 1881.
Iris brown.

Of these, three or four were observed wheeling about
river Saimá, about a league up it from the Paraná. The
sprawling, quick flight, settling now and again on the roc
edge of the river. Dashing down and skimming the wa
dip every now and again for fish, after which they rise
the air.

196. **Larus maculipennis**, Licht.

♂. Punta Lara, Buenos Aires, Arg. Rep., Feb. 19, 188
♀. Pacheco, Buenos Aires, Arg. Rep., March 16, 1881
♀. Salto, Buenos Aires, Arg. Rep., Oct. 17, 1881.
Iris dark brown.

quired by presentation, 48 by purchase, 2 by birth, and 13 were received on deposit. The total number of departures during the same period by death and removals was 95.

A pair of young River-Hogs (*Potamochœrus africanus*) from Zulu Land, presented by Col. J. H. Bowker, F.Z.S., and Mr. John Dunn, and received August 28th. These are a very interesting addition to the Society's series of Suidæ.

The total number of registered additions to the Society's Menagerie during the month of September was 148; of these 81 were acquired by presentation, 33 by purchase, 7 by exchange, 6 were bred in the Gardens, and 21 were received on deposit. The total number of departures during the same period by death and removals was 87.

The most interesting acquisitions of the month were:—

1. An example of a species of *Canis*, said to have been received from the Amazons, and remarkable for its short coat and short ears. Being unable to identify this peculiar animal with any described form, I have given it the provisional name of the Short-eared Fox (*Canis microtis*).

Mr. Smit's sketch (Plate XLVII.) will give a general idea of this *Canis*, which can only be accurately described after death. It stands about 14 inches high over the shoulders; the body from the nose to the rump is about 30 in. in length and the tail 12 in. The short close fur is generally of a dark iron-grey, the hairs being whitish below and tipped with black; the legs, feet, and tail are darker, nearly black; the ears are short and pale rufous inside and out; the snout is of a darker rufous.

2. A cock and two hens of Elliot's Pheasant (*Phasianus ellioti*), from China, purchased of the Jardin d'Acclimatation of Paris, September 27th. These are young birds, bred in France, and are the first specimens of this fine Pheasant that have reached us.

3. Eight Lemurs from Madagascar were received on deposit, September 30th. These animals belong to a species of *Chirogaleus* new to our Collection, apparently to *C. coquereli* (Poll. et v. Dam).

The total number of registered additions to the Society's Menagerie during the month of October was 121, of which 4 were by birth, 71 by presentation, 39 by purchase, 1 by exchange, and 6 on deposit. The total number of departures during the same period by death and removals was 152.

Mr. Boulenger made the following observations on the subject of the *Heloderma*:—

"A few days after the arrival of the *Heloderma* in the Society's Menagerie, I tried the effects of its poison on a Guinea-pig. The animal was bitten in the leg, and, after two or three minutes, fell into convulsions and died, exactly as if bitten by a Viper. Besides, no doubt could be entertained as to the poisonous nature of the *Heloderma* after the careful investigations recently made by Dr.

larvæ obtained, I did not succeed in rearing any, although every care was taken to give them fresh food every morning and evening. The young larvæ fed well and appeared to be in excellent health, till the second or third time of shedding their skins; they then died by dozens, principally from diarrhœa. I had several hundreds of the larvæ of *Actias selene*, which fed upon walnut. Some of these I placed in a cage in the Gardeners' greenhouse, thinking perhaps the Insect-house did not suit them; but they died there also, although one or two grew to be about 1½ inch long. Not only did these exotic species die, but also such hardy European species as *Sphinx pinastri*.

Larvæ which were introduced into the house nearly full-fed did much better; but those that were bred in it, with one or two exceptions, died. I am quite unable to say what was the cause of the diarrhœa; but I am inclined to think that the heat of the house during the nights was too great. This, however, could not be avoided, as it was necessary to keep the house very warm, on account of the Birds-of-Paradise being there.

It is generally said that the silk-producing Bombyces are much degenerated by "breeding in;" but this could hardly have been the case with *Actias selene*, *Attacus roylei*, and *Telea polyphemus*, as the insects from which the young larvæ were bred were exceedingly fine, and it is rather difficult to get these species to pair *in confinement*; at the same time it is possible that these and other species (now there is such a demand for them) are "bred in" in their native countries by the persons who supply the European dealers.

The examples of *Attacus mylitta*, which were sent home by J. Wood-Mason, Esq., and those of *Attacus atlas*, which were purchased, were all dead in the cocoons with the exception of two specimens of each species. This, I fear, was the result of getting a chill *en route*, as the insects were perfectly formed.

Of perfect insects I had generally a good series on exhibition, especially of the beautiful Indian Moon Moth (*Actias selene*)—the first specimens emerging on the 18th April.

Attacus roylei was exhibited for the first time, and also specimens of *Cricula trifenestrata* and *Hypochera io*.

Of Butterflies, the following species were exhibited for the first time:—

Thais polyxena,
Parnassius apollo,
Vanessa xanthomelas,
—— *levana*, var. *prorsa*,
Argynnis paphia,
Lycæna iolas,
Thecla betulæ,
—— *spini*,

and also several species of the Sesiidæ or Clearwings (see P. Z. S. 1882, p. 548).

Of Moths, *Sphinx pinastri*, *Deilephila vespertilio*, and the beautiful North-American *Ceratocampa imperialis* were the most noticeable species exhibited for the first time.

The following letter, addressed to the Secretary by Mr. E. L. Layard, F.Z.S., was read:—

"Noumea, Aug. 22, 1882.

"SIR,—In a 'Note on the genera *Schœnicola* and *Catriscus*' (P. Z. S. 1882, pp. 919 & 920), Mr. Sharpe alludes to a skin in the British Museum of *Schœnicola platyura*, obtained 'from Mr. Cuming, who received it doubtless from one of his correspondents, perhaps Mr. Thwaites or Mr. Layard.'

"It will narrow the question if I state that Mr. Cuming *never received a single specimen of any bird whatsoever from me.* We exchanged *shells*, but never had any communication respecting birds. If Mr. Cuming got the skin in question from Mr. Thwaites, the latter probably procured it in the *mountainous* regions of the central province (Kandy), where he lived. I have no recollection of the bird myself."

Professor Jeffrey Bell exhibited some examples of *Limnæus truncatulus*, which had been given him by Mr. A. P. Thomas[1], who has lately shown that that species is the chief host of the larva of the liver-fluke.

Mr. H. E. Dresser exhibited the type specimens of *Melittophagus boehmi*, Reichenow (J. f. O. 1882, p. 233), and of *Merops dresseri*, Shelley (P. Z. S. 1882, p. 302), and showed that these birds are specifically identical. The type of *Melittophagus boehmi* lacked the central elongated rectrices, and was therefore placed in the genus *Melittophagus*, whereas, as would be seen by the more perfect specimen described by Capt. Shelley, this bird was a true *Merops*.

Professor Flower exhibited the skull of a young Chimpanzee, which had been sent to him from the Soudan by Dr. Emin Bey. The exact locality in which the animal was taken was not given; but it was stated to have lived for some weeks in Dr. Emin Bey's house at Lado.

Prof. Flower made the following remarks on the skull:—

This skull has the ordinary milk-dentition complete, except that the lower canines are not fully exserted. The first true molars are altogether concealed within the alveoli. Although the lower part of the face, the base of the skull, and the teeth precisely resemble those of Chimpanzees of corresponding age from the west coast of Africa, the upper part of the cranium presents a most striking difference, as seen in the accompanying outline (p. 635). The frontal region, instead of receding at a gentle slope from the supraorbital ridge, rises far more vertically, continuing the line of the face upwards. From the occiput the hinder part of the cranium slopes up almost in a straight line towards the forehead, so that the upper contour, instead of forming a nearly even low arch with its highest part about the centre, or over the external auditory meatus, is formed mainly by two lines, a short anterior and a longer posterior one, which meet at an open rounded angle at the highest point, which is considerably in front of the middle of the cranium.

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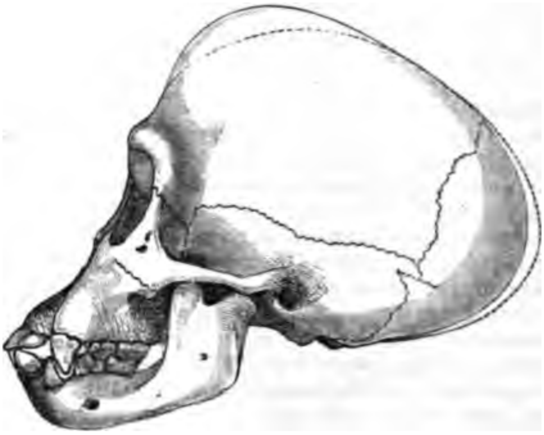
[1] Journ. R. Agricult. Soc. xviii. p. 452 (1882).

In addition to, and probably connected with, this peculiar form of cranium, is to be noted the absence of all trace of a fronto-parietal or coronal suture, and the partial obliteration of the sagittal suture, both of which in all other Chimpanzees examined are open long after the age to which this individual had attained. The sutures between the exoccipitals and supraoccipital are also consolidated to a greater extent than is usual at this age; but the temporo-parietal and the occipito-parietal or lambdoidal sutures are perfectly distinct.

The following comparative measurements are taken from some of the principal points now usually adopted in craniometry: —

	Soudan Chimpanzee.	West-African Chimpanzee.
Basion to alveolar point..............	76	72
„ narion....................	66	64
„ ophryon..................	73	70
„ middle of frontal bone	84	74
„ bregma	87[1]	74
Length of cranium (ophryo-occipital) ..	103	107
Maximum parietal width	88	89
Maximum frontal width	77	86

It will be seen from these and from the figure, that the skull is



Skull of a young Chimpanzee.

actually shorter than that of a slightly younger specimen from the west coast, although so greatly higher as well as wider in the frontal region. It presents in fact a true case of the deformity recognized by anthropologists as *acrocephaly*, a deformity also in Man associated with the premature consolidation of the same sutures as those affected in the present specimen, and which, it is supposed, has influenced the form of the cranial bones. We have here, then, in all probability, not a case of specific or even racial distinction, but one of individual variation due to pathological changes at an early period of development.

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[1] Owing to the absence of the coronal suture, the exact position of the bregma can only be guessed.

Acrocephaly of a precisely similar type occurs sporadically in men of all races. The Museum of the Royal College of Surgeons possesses good examples of it in a West-African Negro, an Arab, a Polynesian, and an Englishman; but as I believe it has not hitherto been observed in any of the Anthropoid Apes, the present specimen is one of great interest.

The following papers were read:—

1. Supplementary Notes on the Anatomy of the Chinese Water-Deer (*Hydropotes inermis*). By W. A. Forbes, B.A., Prosector to the Society.

[Received July 18, 1882.]

An adult male of this curious Deer having lately passed through my hands, it may be advisable to record my notes on certain of its soft parts, on the condition of which the late Prof. Garrod laid considerable stress in the classification of the Ruminants, but some of which were, I believe, unknown to him, the specimen of *Hydropotes* described by him [1] having been a young (in fact still-born) example of the opposite sex.

As regards the male organs of generation, the *glans penis* is an elongated tapering compressed cone, with the urethral opening subterminal, thus closely resembling those of *Capreolus*, *Cervulus*, and *Elaphodus*. There are no traces of Cowper's glands, as is also the case in the first and last of the three genera just named. In these respects, then, *Hydropotes* resembles most closely *Capreolus* and *Elaphodus*, and differs from the Rusine Deer, with which, according to the views of Sir Victor Brooke at one time [2], in part indorsed by Garrod [3], it was supposed to have perhaps its closest relations. The large "rusiform" Spigelian liver-lobe, which was found by the last-named anatomist in the young of *Hydropotes*, and the presence of which he adduced as supporting those views, is, however, quite absent in the liver of the present specimen. There is a similarly situated "spurious cystic fossa," containing, however, no gall-bladder, only a minute almost atrophied cord, of apparently vascular nature. The caudate lobe is well developed.

In the rumen of the stomach the villi, where best developed, are pretty uniformly filiform, slightly flattened, but not clavate. The

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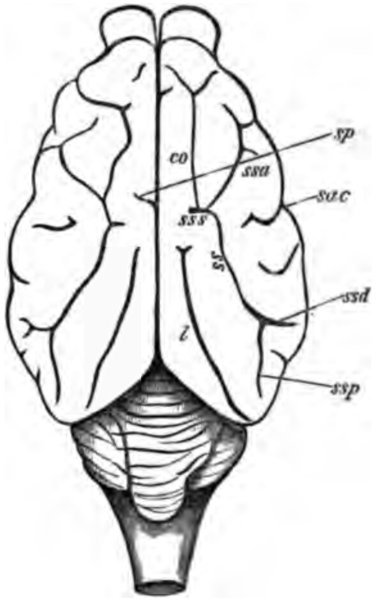
[1] *Cf.* P.Z.S. 1877, p. 789, and Coll. Papers, pp. 422–425.

[2] P.Z.S. 1872, p. 525.

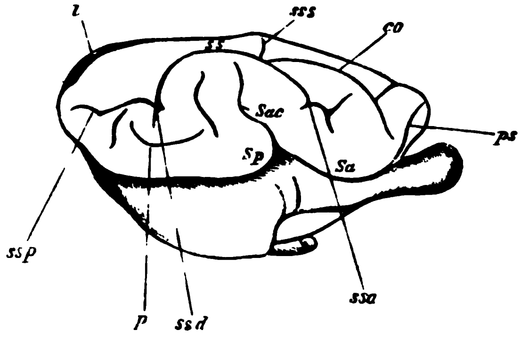
[3] Coll. Pap. p. 425.

Fig. 1.



Upper surface of brain of Chinese Water-Deer

Fig. 2.



Side view of brain of Chinese Water-Deer.

reticulum-cells are rather shallow. The psalterium has, as I count, nine primary laminæ, and is quadruplicate.

The length of the intestines in the present specimen (the body of which had a total length of 33 inches, including the three-inch-long tail) was 29 feet 2 inches, 21 feet 7 inches being small intestine, the remainder (7 feet 7 inches) colon and rectum. The relative lengths, therefore, of these parts were not very different from those that obtained in the younger individual already described. The cæcum was three inches long. There were 2½ coils in the colic spiral; and at the junction of the ileum and cæcum is a distinct glandular patch, like a largish "Peyer's patch," though not having the complex structure of the ileo-cæcal gland met with in *Moschus*, *Cervus*, *Camelopardalis*, &c.

The only figure hitherto extant (that given by Prof. Garrod in his paper already quoted) of the brain of *Hydropotes* having been taken from a very young specimen, it may be worth while to give figures of the superior and lateral aspects of that removed from this adult specimen, which will be useful for comparison with Garrod's earlier one, as well as with those given by that author and Prof. Flower of the brain in *Elaphodus*, *Moschus*, and *Pudua*, and with the series of semidiagrammatic sketches illustrating Dr. Krueg's valuable paper on the cerebral convolutions of the Ungulata generally [1], whose nomenclature on the subject I have also adopted.

In its cerebral organization *Hydropotes* approaches the genus *Capreolus* more nearly than any other Cervine form known to me, the similarity of the two being obvious on comparison of the figures now exhibited (see p. 637) with those of Leuret and Gratiolet [2] and of Krueg [3] of the Roe. From *Elaphodus* and *Pudua* these two forms differ in the entire disappearance (save very slightly anteriorly) of the calloso-marginal ("splenial") sulcus from the superior aspect of the hemispheres, owing to the greater "pronation" of their brain generally.

Sir Victor Brooke has been led, from a consideration of other points [4], to associate *Hydropotes* and *Capreolus* with *Alces*, as a group *per se*, with affinities in some points in the direction of the Old-World (Plesiometacarpal), in others in that of the New-World (Idiometacarpal) forms. It appears to me that the additional evidence in this paper, especially that derived from the resemblance of the generative organs, is strongly in favour of this association, so far, at least, as *Hydropotes* and *Capreolus* are concerned. The general similarity in *facies* of *Capreolus* to *Hydropotes* has often struck me, and has even, I believe, led others into the error of mistaking one for the other!

That *Hydropotes* is in no way intimately related to *Moschus* was already amply demonstrated; and the latter form also differs, as we now know, in the conformation of its glans penis and in the possession of Cowper's glands.

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[1] Zeitschr. f. wissenschaftl. Zool. xxxi. pp. 297–344. *Cf.* also Garrod, Coll. Papers, pp. 512–517.

[2] Anat. Syst. Nerveux, Atlas, pl. x.

[3] *L. c.* pl. xxi.

[4] P. Z. S. 1878, p. 889.

2. Notes on the Habits of the Aye-aye of Madagascar in its Native State. By L. Baron, L.M.S. Missionary.

[Received August 13, 1882.]

Having recently passed through that part of Madagascar which is the habitat of the Aye-aye, and having made made careful inquiries from the Malagasy respecting the habits of this strange creature in its native haunts, I have thought that the information gained might be of interest to the members of the Society, and have therefore noted down the results of my inquiries.

The Aye-aye lives in the dense parts of the great forest that runs along the eastern border of the central plateau of the island, but only in that part of it which separates the Sihànaka province from that of the Bétsimisàraka, and which is about twenty-five miles from the east coast, in latitude 17° 22′ S. or thereabouts. Possibly there are other parts of the country where the Aye-aye is found; but so far as my knowledge extends (and I have made inquiries in different parts of the island) this is the only region where the creature finds its home. In Carpenter's 'Zoology' the Aye-aye is said to be "very rare even in its native country;" and Mr. Gosse, in one of his books, conjectures that it is probably nearly extinct. From what I have gathered from the natives, it seems to be pretty common, its nocturnal habits and the superstitious awe with which it is regarded (and of which I shall presently speak) accounting for its apparent rarity.

The native name of the animal is Haihay (Hībī); but this is not derived from the "exclamations of surprise" which the natives "exhibited at the sight of an unknown animal," but is simply onomatopoetic, the creature's call being "Haihay, Haihay." The animal, as is well known, is nocturnal in its habits, prowling about in pairs—male and female. It has but one young one at a birth. It builds a nest about two feet in diameter, of twigs and dried leaves, in the dense foliage of the upper branches of trees. In this it spends the day in sleep. The nest is entered by a hole at the side.

The teeth are used in scratching away the bark of trees in search of insects, and the long claw in digging out the prey when found. A white insect called *Andraitra* (possibly the larva of some beetle) seems to form its chief food. I was told that it frequently taps the bark with its fore feet, and then listens for the movement of its prey beneath, thus saving itself useless labour. It does not flee at the sight of man, showing that for generations it has not been molested by him; which is indeed true, as the following will show. The natives have a superstitious fear of the creature, believing that it possesses some supernatural power by which it can destroy those who seek to capture it or do it harm. The consequence of this is that it is with the greatest difficulty one can obtain a specimen. With most of the people no amount of money would be a sufficient inducement to go in pursuit of the creature, "because," say they-

"we value our own lives more than money." It is only a few of the more daring spirits among them who, knowing the *ody*, i. e. the secret by which they can disarm it of its dreaded power, have the courage to attempt its capture. Occasionally it is brought to Tamatave for sale, where it realizes a good sum. Now and then it is accidentally caught in the traps which the natives set for Lemurs; but the owner of the trap, unless one of those versed in the Aye-aye mysteries, who knows the charm by which to counteract its evil power, smears fat over it, thus securing its forgiveness and good-will, and then sets it free. The story goes that occasionally when a person sleeps in the forest the Aye-aye brings a pillow for him: if a pillow for the head, the person will become rich; if for the feet, he will shortly succumb to the creature's fatal power, or at least will become bewitched. Such is the account the natives give of the curious *Chiromys madagascariensis*.

Antananarivo, Madagascar, July 1882.

3. On the Natural Position of the Family *Dipodidæ*.

By G. E. Dobson, M.A., M.B.

[Received October 16, 1882.]

Since Mr. G. R. Waterhouse, in 1839, proposed what may be with justice termed the first approach to a natural arrangement of the families of Rodentia, other systems of classification, down to that of Alston in 1876, have from time to time appeared. In all, however, the family *Dipodidæ* has been placed either next the *Muridæ*, or in the same group with them, being separated from the hystricine rodents evidently mainly on account of the united condition of the tibia and fibula, but possibly also by some of the older zoologists on account of the superficial resemblance borne by one of the species at least to the true Mice. The object of this communication is to show that the position hitherto assigned to these rodents cannot be maintained on natural grounds.

Lately, while investigating the various modes of arrangement of the long flexor muscles of the feet of Mammalia, I was struck by the fact that the species of *Dipodidæ* agreed altogether in the united condition of the tendons of these muscles with the hystricine rodents, and not with the *Myomorpha*, in which group they have hitherto been placed. The importance of this character, which I have elsewhere[1] fully demonstrated, led me to carefully inquire into the value of the so-called murine affinities of the *Dipodidæ*, with the result that these may be said to consist only in the united condition of the leg-bones. On the other hand, all the lead-

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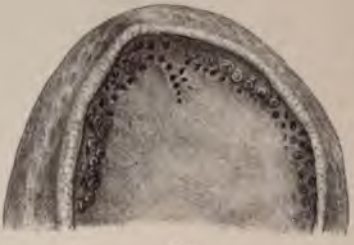
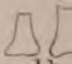
[1] In a paper, "On the Homologies of the Long Flexor Muscles of the Feet of Mammalia," read before the Biological Section of the British Association for the Advancement of Science at Southampton, in August last, and subsequently published in the 'Journal of Anatomy and Physiology,' vol. xvii. (1882–83).

P. Z


1a.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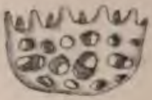
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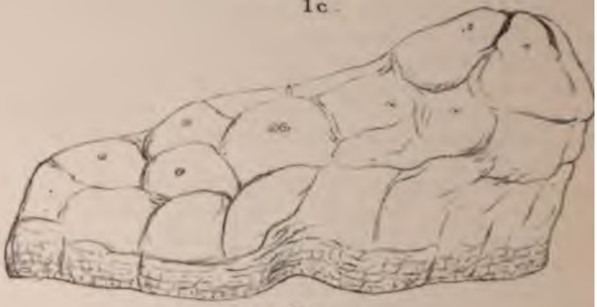
2.b.

3.

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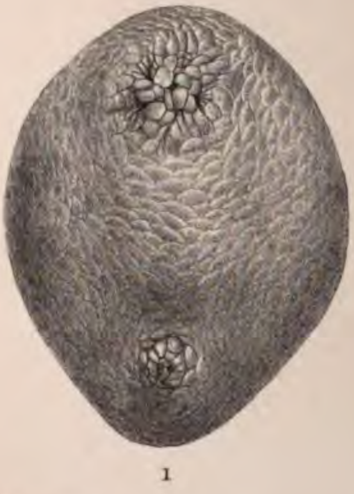
1

2.

R. Mintern, del. et lith.

M

1. PSOLUS (LOPHOTHURIA) PERONII.
2. PSOLUS (HYPOPSOLUS) AMBULATOR.

ing features of the *Dipodidæ* connect them with the *Hystricomorpha*, as, for example, the large infraorbital foramen (rivalling even the orbital in size) and the stout zygomatic arch in which the malar is not supported by a continuation of the maxillary zygomatic process—characters eminently distinctive of the hystricine rodents. Moreover, as in this group, none of the molars are tuberculate, but exhibit transverse laminæ as in *Chinchillidæ*, with the species of which family the *Dipodidæ* agree, not only in many striking superficial points of resemblance, as in the shape of the ears, muzzle, &c., but also in the peculiar form of the penis, of which the glans is armed, as in the Cavies and Pacas, on the upper surface with a pair of soft spines and numerous horny scutes, so differing essentially from the soft unarmed state of the same part in the *Myomorpha*.

The united condition of the leg-bones is evidently the result of special adaptation of the hind limbs for leaping; and it would be as absurd to separate this family from the *Hystricomorpha*, on this account, as it would be to elevate the *Dipodinæ* into the rank of a distinct family, and form a new group for their reception, because they differ from all other rodents in the united condition of the metatarsals, which are fused together so as to form a single bone, a condition as manifestly the result of adaptive modification as the union of the fibula with the tibia.

We may conclude, therefore, that the *Dipodidæ* must be classed as hystricine rodents having the bones of their hind limbs specially modified for leaping, and that their nearest existing allies are the family *Chinchillidæ*.

4. Studies in the Holothuroidea.—I. On the Genus *Psolus* and the Forms allied thereto. By F. Jeffrey Bell, M.A., F.Z.S., Professor of Comparative Anatomy in King's College, London.

[Received October 18, 1882.]

(Plate XLVIII.)

In the following paper, and in those of which it will as I hope form the first, it is my intention to bring together into a connected form all the information which I have acquired in the difficult task of naming the collection of Holothurians in the British Museum. Various circumstances did no doubt conspire to prevent these specimens being worked out as they came into the collection; but I fancy I am hardly wrong in imagining that a not unconsidered factor was the troublesomeness of the subject, and the great demand that it makes upon the time and patience of the student.

Works of the highest importance and greatest scientific value have appeared on these forms; the anatomical monograph of Tiedemann, the researches of Johannes Müller, and the magnificent firstfruits there he makes no use of his own name *Cuvieria*, but applies that of *Berenice* to a genus to which, as Prof. Haeckel (see his Syst. Med. i. p. 152) assures us, his earlier and beautifully figured *Cuvieria carisochroma* would belong.

It follows therefore that Jäger (De Holoth. p. 30) is right in saying, "Cuvier hujus tribus autor est," and that de Blainville (Actin. p. 191), Brandt (Prodr. p. 47), and Selenka (Zeitschr. f. wiss. Zool. xvii. p. 343) are, in citing Péron as the author of the name, almost as wrong as Haeckel, who (*loc. cit.*), in writing "Trotzdem hat später (1817) Péron denselben Gattungnamen für ein Echinoderm *Psolus* eingeführt," and Verrill (Proc. Bost. Soc. N. H. x. p. 353), by adding 1817 to the name Péron, commit the additional error of forgetting that it was seven years earlier, that is in 1810, that there was lost to science an investigator so enthusiastic and so distinguished that one feels the chilly formality of the terms in which regret was expressed at his death—"aussi affligeante pour les amis des sciences qu'elle le fut pour les siens propres" (Pref. to vol. ii. of the 'Voyage').

Curiously enough, the history of the name does not end here. Just as *Cuvieria* dropped out from Péron's names for Medusæ, so did Cuvier's picture of *Hol. cuvieria*, which appeared in the 1817 and 1829 editions of the 'Règne Animal,' disappear from the plates of the magnificent edition of that monumental work which we owe to the devotion of a "réunion de disciples de Cuvier."[1] It did not disappear, however, before it gave rise to one of the most curious mistakes committed by a famous naturalist: a reference to the account given by de Blainville in the Dict. Sc. Nat. xxi. (1821) pp. 315–317, shows quite clearly that that distinguished student mistook the oral for the anal pole of the body. As the description is rare, if we may judge from the fact that it was not seen by Prof. Semper (Hol. p. 241), I propose to quote it in full:—

"*H. cuvieria*, G. Cuv. Règne Anim. pl. xv. 9. Corps ovale, comme rugueux, l'anus supérieur entouré de cinq tentacules squamiformes; les tentacules de la bouche au nombre de dix (?) et presque filiformes. Des mers de l'Australasie (?)."

A comparison of this description with the figure of Cuvier and with that given for what is clearly the same form by Selenka (Zeits. wiss. Zool. xviii. pl. viii. fig. 1), who calls it *Stolinus cataphractus*, will abundantly prove the statement now made. That being so, it is clear that the term *cuvieria* has no claim for application to the species, de Blainville's as much as Jäger's "Beschreibung" being "ungültig," in consequence of which, to use the words of Semper (*loc. cit.*), "wird der Selenka'sche Artname '*cataphractus*' eintreten müssen." Perhaps, indeed, no creature has been more misrepresented; for C. A. Lesueur[2] says that "the feet are placed behind."

After a discussion which, however barren in the eyes of a naturalist, is not without necessity for the work of the systematist,

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[1] Paris, Victor Masson (1849), in 22 vols.

[2] Journal Acad. Nat. Sc. Philadelphia, iv. p. 156. It is curious to note that of the 'Holothuries Cuviéries' of Lesson, not one is a *Psolus* (see Cent. Zool. p. 239).

and which will, I trust, be found to contain an ex
the facts necessary for forming a judgment on
applied to this generic division, I pass to an enumer
forms supposed to be specifically distinct, and, secon
names given to forms already described.

I. *List of the Species regarded as dist*

1. *antarcticus*, Philippi, Arch. Nat. 1857, p. 133
2. *appendiculatus*, de Blainv. Dict. Sc. Nat. xxi.
3. *boholensis*, Semper, Holoth. p. 62.
4. *cataphractus*, Sel. Zeitsch. wiss. Zool. xviii. p.
5. *complanatus*, Semper, Holoth. p. 61.
6. *ephippifer*, Wyv. Thomson, Journ. Linn. Soc
7. *fabricii*, Düben & Koren, Hlgr. Kgl. Svens
p. 316 (note).
8. *operculatus*, Pourtalès, Bull. M. C. Z. i. p. 12
9. *phantopus*, Strussenfeldt, Abh. schwed. Ak. x

10. *poriferus*, Studer, M.B. Ak. Berl. 1876, p. 45
11. *regalis*, Verrill, Proc. Bost. Soc. N. H. x. p.
12. *squamatus*, Koren, Nyt Mag. iv. p. 211.

Synonymous terms.

1. *granulatus*, Ayres (Bost. Soc. N. H. iv. p. 63)
2. *lævigatus*, Ayres (Bost. Soc. N. H. iv. 25)=
3. *sitchaensis*, Brdt. (Prod. p. 47)=*fabricii*[3].

[4. *Psolus forbesi* (Ann. N. H. (1) xv. p. 174
existence than such as is based on the sentence of
Fauna, pt. ii. p. 73), "one closely allied to the gen
Forbes."]

PSOLUS FABRICII.

The most important fact with regard to this spec
of the British-Museum collection brings to light is
its geographical distribution, which can hardly be
expected. Among the collections made by Captain
R.N., in the Japanese seas (presented to the Trustees
Jeffreys) are some small specimens which cannot, I t
to any other than this species; for though they prese
of the scales which is remarkable when compared w
that imbrication in two large specimens from the coa
it is not so remarkable when we take into considerati
intermediate in size between these two sets, which
Greenland by H.M.S. 'Valorous' (and figured by
and Sladen in their 'Arctic Echinodermata,' pl. i.).

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[1] The *Psolus granulatus* of Grube (Actin. &c. d. Adriat. u.
p. 38) does not belong to this genus, but to *Hemicrepis*, J. M

[2] See Stimpson, Inv. Gd. Man. p. 16 (1853, and not 1854
and Verrill, Proc. Bost. Soc. N. H. xii. p. 353).

[3] See H. Ludwig, Zeitsch. f. wiss. Zool. xxxv. p. 588.

be noted (1) that there is just as much imbrication in a large specimen from Massachusetts Bay, collected by the United-States Fishery Commission, and presented by the Smithsonian Institution; (2) that taking the three Greenland specimens already referred to, we find a most obvious relation between the size of the example and the extent of the imbrication of the scales, the latter decreasing as the former increases; (3) that the same phenomenon is to be observed in the series of Japanese specimens, a study of which leads one to the conclusion that the increase in the covering-capacity of the bivial armature is, at any rate, partly due to a diminution in the extent of the overlap of the different plates,. At the same time it is to be remembered that the Japanese specimens examined are all smaller than any one of those from the Atlantic which I have had the opportunity of comparing with them. And this must be borne in mind when the question of the range of distribution of this species again comes under discussion; the writer who then treats of the matter will not, I trust, fail to carefully study the philosophical remarks on this subject which are to be found in Mr. W. Percy Sladen's account of Captain St. John's Japanese Echinoidea and Asteroidea[1], where the importance of distinguishing the characters of forms with a wide distribution is most wisely insisted on.

In addition to the indications of a wider distribution than was suspected for this species, the preceding discussion brings also into prominence the fact that younger are more strongly imbricated than older specimens, but that, so far as we can judge from a single example, the American race retains more than the European this overlapping of the plates.

Just as the appearance of *Psolus fabricii* or a most closely allied form in the Japanese seas is a matter which need excite no wonder, so the second locality whence, as I fancy, the species is now for the first time recorded, only brings the species into the category of such circumpolar forms as *Strongylocentrotus drobachiensis*; on the other hand, now that we know that the species is to be found at Kamtchatka, we are able to accept, with, as it were, a kind of personal experience, the fusion of *P. sitchaensis*, Brdt., with *P. fabricii.*

PSOLUS SQUAMATUS.

Two magnificent specimens of this species, the longest 130 mm. long, from the Gulf of St. Lawrence, were presented in 1880 by Principal Dawson; and their examination brings to mind the view of some naturalists[2] that *P. fabricii* is nothing more than a variety of it.

At the first sight of the British-Museum specimens, such a view would be warmly rejected; but now that we have learnt the kind of changes that occur in imbrication during growth, there would be no reason to imagine, even if we had not the figure of Koren, that *P. squamatus* in the young condition has the plates less imbricated than *P. fabricii*. On the other hand, the granulation of the scales in *P. squamatus* appears to be closer and the grains smaller; and I have

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[1] Jour. Linn. Soc. xiv. (1879) pp. 429–434.

[2] Cf. Duncan and Sladen, op. cit.

not been able to detect, in what is called *P. squamatus*, t
shaped spicules which are so well-known in *P. fabricii*; r
they seem to have been seen by Düben and Koren, who, at
do not figure them. This, of course, is only negative evide
indeed, the whole discussion is a somewhat barren one unt
series of forms of all sizes can be brought together.

PSOLUS ANTARCTICUS.

In connexion with the discussion which is raised under
of *P. fabricii* as to the extent of the area of distributio
northern form, and the words of Philippi when describing t
ern form, "diese Art ist der *Holothuria squamata*, O. Fr.
ähnlich, dass ich lange gezweifelt habe, ob ich sie nicht oh
res dafür ansprechen sollte," it may be well to state explici
the differential characters appear to be.

(1) The body is much more flattened, or compressed fro
downwards, instead of from side to side; very small exan
quite flat.

(2) The oral and anal valves are very much larger; and
as Philippi has already remarked, very much greater regu
their arrangement.

(3) The bare integument on the trivial surface is ver
thinner, and is in young specimens quite transparent.

(4) The scales are larger, and therefore less numerous:
also much less granulated; but this is a character which
much within the range of a species that too much value
be set on it.

On the whole, perhaps, *P. antarcticus* is as distinctly m
species as any in the genus.

PSOLUS REGALIS.

The description given by Ayres of the internal character
species is so exact, that one regrets that he was not acquain
the work of Grube, in which the name *Psolus granulatus* l
given to a totally different animal.

So far as the specimens now before me allow of an opi
would seem that even the external form is sufficient to dis
the species from *P. phantapus*. *P. regalis* is longer and n
and the elongate-conical "tail" is much more nearly the res
gradual tapering of the body; the granulation is much mor
diffused, and there are no signs at all of any large plates.

The specimens in the national collection were presented
Nova-Scotia Commissioners, and are all of large size.

PSOLUS PHANTAPUS.

Prof. Duncan and Mr. Sladen (op. cit.) direct attention to
semblance between the young of *P. fabricii* and of this specie
their remarks, as I understand, on specimens, a few millimetr
which were determined by the Rev. A. M. Norman as the y
P. phantapus. Such of these examples as are in the British

would have probably found themselves associated with *P. fabricii* had they not borne Mr. Norman's name. So far as can be gathered, no further information is accessible as to the early stages of the "tailed" species; and till such evidence or intermediate forms are to hand, it would perhaps be well not to use the information as undoubtedly exact; at the same time it is quite certain that, as they got the information from specimens determined by Mr. Norman, Messrs. Duncan and Sladen were fully justified in noticing it.

Psolus (Lophothuria) peronii, n. sp. (Plate XLVIII. fig. 1.)

Form elongated, rounded, no caudiform prolongation; back and sides evenly rounded; neither oral nor anal region specially prominent; median row of suckers confined to three or four pairs at either end.

The body is covered by a very large number of scales, set pretty regularly in rows, only slightly imbricated near the margin. The scales may be covered completely by granules; or the central portion may be bare of them; or the whole scale may be free from granules, which may be found only around it. The irregularity presented by the scales is to be observed also in the oral and anal plates; as the covering-plates converge towards the mouth, some become larger, barer, and more tubercular in appearance: the same obtains with the anal region; but there is a very large amount of variation in the appearances produced.

The retractors of the pharynx are very long; the joints of the calcareous ring are well developed (Plate XLVIII. fig. 1 *b*); and there is a large saccular Polian vesicle.

The spicules from the integuments of the "foot" are of very much the same character as in *P. phantapus*; but the projecting spokes are rather long. They vary considerably in size (fig. 1 *c*).

Measurements:—length 60, 56, 55 mm.
breadth 34, 56[1], 40 mm.
height 23, 33, 23 mm.
Length of Polian vesicle (at least), 8, 11 mm.

No definite locality can be given for the species; some of the specimens from the Haslar Hospital are stated to have been collected by Berthold Seemann. I have not been able to form a very clear idea of *P. operculatus* (Pourtalès); there is no doubt, of course, that it belongs to the Lophothurian subgenus: a number of specimens would seem to have been collected; and we may therefore presume that it is a rather small species (the length given by Pourtalès being 1½ inch, and the breadth ¾ inch). *P. peronii* runs very much larger than this, and it is at least twice its size. So, again, the colour of *P. operculatus* is said to be light grey; this is not the case with *P. .peronii*, for the pale yellow of some specimens is replaced by dark brown in others.

[1] Contorted.

HYPOPSOLUS, subgen. nov.

It is necessary to institute a new subgeneric division for a remarkable form, of which a complete account cannot be given, owing to the fact that there is, unfortunately, only a single specimen. The following, however, are important distinctive characters.

The covering-plates are mostly of large size and of considerable thickness, the whole covered by a rather thick integument, in which there are some calcareous deposits; the trivium is almost completely occupied by suckers. Tentacles? (retracted).

PSOLUS (HYPOPSOLUS) AMBULATOR, n. sp. (Plate XLVIII. fig. 2.)

There are six, not very regular, rows of large plates; at the edges there are a number of small scales, imbricated in the manner so common in the genus. The large plates extend round the base of the oral covering-plates and behind the anus; there are four or five plates in most of the rows; the large plates are of very various shapes; and though there are signs of a tendency to, there cannot be said to be any imbrication. The mouth and the anus have the positions ordinarily seen in other species of the genus; the five triangular oral plates are of very large size; but the five found round the anus are of a particularly small size. Many of the large plates, and of the orals, have one, two, or, in rare cases, three small pores on their integument; when the plate is laid bare, the pore is found to be the orifice of a small pit in the substance of the plate itself: the function of these plates cannot be even guessed at, their small size almost precluding us from the supposition that they are of a marsupial nature [1]—unless we suppose also that the present specimen is a male, or, in other words, a specimen in which the character is only faintly indicated.

On the trivial surface there are five or six rows of suckers in each lateral ambulacrum, and as many as ten in the median one; at either end the median is continuous with the two lateral ambulacra, and for the rest of the flat surface is separated from them by a narrow, bare, corrugated band.

Measurements.

	mm.
Length of trivial surface	68
Breadth of trivial surface	35
Height of anterior end	31·5
Height of posterior end	16

Size of some large plates = 12 × 10 mm.; 11 × 8; 9 × 6.

Hab. Australia.

Limits of the Genus.—It will be seen that I have established a subgeneric division for the reception of a form remarkable for the thick covering of integument which is found over the large plates of the test. The differences do not seem to me to be of really generic value, any more than are the distinctions which some have seen between what have been called *Psolus* and *Cuvieria*, or *Psolus* and *Lophothuria*, no naturalist, so far as I know, having followed Bronn (Classen u. Ordn. i. p. 404) in the use of the term *Lepidopsolus*.

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[1] Can they be compared with the perforations "for the passage of an ambulacral tube," found in a form allied to *Psolus*. See Sir Wyv. Thomson, 'Nature,' vii. p. 388.

A naturalist need know no other species than *P. fabricii* and *P. phantapus* to see what are the kind of claims for generic separation. In the one case there is a heavily-armed test, formed of strong imbricating scales, with only the margin of the foot provided with sucking-feet, and with the tentacles richly branched; in the other there are granulations, less richly branched tentacles, and a median set of sucking-feet[1].

An investigation of the internal anatomy will not, however, reveal a difference in the part which should especially be affected in the more firmly bodied forms. We might, that is, expect to find valuable distinctive marks in the grade of development of the Polian vesicle, the size of which in *P. fabricii*, or any other heavily-armed form, would be easily enough ascribed to the fact that the impossibility of the walls of their body aiding in the propulsion of fluid through the ambulacral canals would require the propelling organ to be of larger size, and doubtless also of greater proportional strength. *À priori* considerations of this kind are often shown by the dry light of dissection and observation to be as little in consonance with fact as the nature of things allows; and that is certainly the case here: the Polian vesicle of *Psolus regalis* is proportionally as large as, even if it be not larger than, that of *P. fabricii*. A fact of this kind does, at the same time, teach us that what is apparently an external difference of great importance may be so as between, say, *Psolus* and *Holothuria*, but is not a great one between *Psolus* and *Lophothuria*. Such being the case, we have here an example of affinities so peculiar that what very rarely obtains among Echinoderms, at any rate, does seem to be presented here—a relationship that can best be indicated in the language of systematic zoology by making use of subgeneric divisions.

While *Psolus* may be spoken of as a Gasteropodous dendrochirotous Holothurian, with a flattened trivium and the bivium without suckers, and invested in a firm covering of calcareous pieces, *Psolus* (*Eupsolus*) s. str. will have granular plates, a median row of trivial suckers, and no basal web to the tentacles; *Lophothuria* large granulated scales or plates, no median row of suckers, and a basal web to the more richly branched tentacles; while *Hypopsolus* has the scales invested in a thick integument, and the trivial suckers numerously developed.

It is possible that future investigation will justify us in associating with these, as another subgenus, *Lissothuria*[2], where "the upper surface of the body is covered with a soft smooth skin, in which are imbedded minute perforated plates."

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[1] See Verrill, Proc. Bost. Soc. Nat. Hist. x. p. 353.

[2] Trans. Conn. Acad. i. p. 322.

DESCRIPTION OF PLATE XLVIII.

Fig. 1. *Psolus* (*Lepidopsolus*) *pawsoni*, n. sp. Upper view: nat. size.
1 *a*. —— (——) ——. Portion of trivial surface (to show arrangement of suckers): nat. size.
1 *b*. Pharynx of *P. pawsoni*.
1 *c*. Spicule of *P. pawsoni*.
2. *Psolus* (*Hypopsolus*) *ambulator*, n. sp. Upper view: nat. size.
2 *a*. —— (——) ——. Portion of trivial surface (to show arrangement of suckers): nat. size.
2 *b*. Outline view from the side, to show general configuration.
3. Enlarged view of portion of dorsal surface of *P. regalis*, to show the granular scales.
4. Enlarged view of portion of dorsal surface of *P. fabricii*, to show the granulated plates.

5. Note on a Crinoid from the Straits of Magellan.

By F. Jeffrey Bell, M.A., F.Z.S.

[Received October 23, 1882.]

In the last set of specimens received from Dr. Coppinger (Surgeon, H.M.S. 'Alert') is a single example of a Crinoid from the Straits of Magellan, which, by some accident, was not forwarded along with the other Echinodermata sent by him some time ago. In giving an account of that collection to the Society[1], I directed attention to the absence of any representative of the Crinoidea; and I might have added that, so far as I knew, no other explorer of the marine fauna of the region from which it came had been able to meet with one.

It was therefore with considerable interest that I noted the arrival of this specimen in the British Museum; and I may add that I looked upon it with no little astonishment, as I conjectured how Dr. Coppinger must have doubted within himself whether he were really south of the Equator, and not again in those Arctic regions where *Antedon eschrichti* is so abundant; for it requires not only some acquaintance with specific characteristics to be able to detect any difference between the northern and the southern forms, but such differences as there are are exceedingly minute.

I have endeavoured to examine fully and carefully into the characters of the single, not quite complete, specimen of the Antarctic form; and although one may detect, on comparison with any given Arctic specimen, certain differences, such as may be expressed by saying that the cirri are a little more delicate, or not quite so long, or that a rather more distal joint is the longest of the series, yet marks such as these cannot be held to be distinctive of any thing more than of individuals.

When, however, we examine the pinnules, we find differences which enable us to distinguish the one from the other. As is well known, the pinnules at about the middle of the arm in *A. eschrichti* have the two basal joints of a notable shape, and so formed as to leave an interspace between them; in the Antarctic form, on the other hand, there is no such interspace, in consequence of the different form of the basal joints, while the distal edge of the succeeding joints is provided with a delicate spinous process, which appears to be absent from the northern form. The accompanying drawings represent the second pinnules of *A. eschrichti* (A), and its variety (B).

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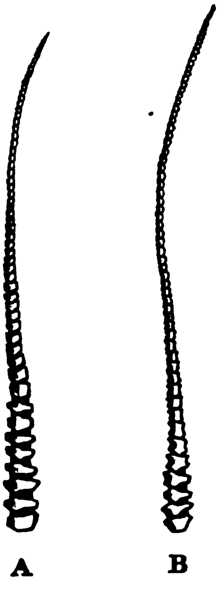
[1] P. Z. S. 1881, p. 87.

A difference of this kind can hardly be taken to be specific, though, of course, there is a "personal equation" in zoology which renders it within the bounds of possibility that some brother naturalist may look upon it as having a higher distinguishing value than I am inclined to ascribe to it. Morphologically, the forms appear to belong to the same species; and the differences are best marked, in the language of systematic zoology, by speaking of the new Crinoid as *Antedon eschrichti*, var. *magellanica*.



It is not for the first time that attention has been directed to a resemblance between an arctic and an antarctic form; but never, perhaps, has the resemblance been so difficult of explanation. For myself, I feel compelled to confess that by no effort of the imagination can I figure to myself the passage of this fixed form over so wide a tract of sea and coast. If such has taken place, it will have to be allowed that the larva can hardly be free for so short a time as is the case with the best-known British species. Nor can it be well

explained by a mere reference to the great range of specific v
which, as we now know, obtains in the Comatulidæ. What
ignorance or prejudice on the part of a naturalist is, if it be
to be kept out of the systematic register; and I conten
therefore with expressing an opinion without letting it appe
technical title of the species.

A case of this kind forces on one's mind a reconsideratio
doctrines of a polyphyletic and a monophyletic origin of
and, as Semper[1] has distinctly shown, of the further questio
difference between the real or objective, as opposed to the sy
or subjective view of what constitutes a species—a differenc
may perhaps be put in other words, as that which obtains
a Linnean and a genetic conception of specific relationship
the *Antedon eschrichti* of Greenland and the *A. eschric*
magellanica, ever had a common ancestor belonging to the
A. eschrichti seems to me barely credible. All, at any rat
mean in now placing the Magellan form in the same sp
A. eschrichti is that, looking to those structural charac
which naturalists distinguish species from one another, I ca
enough to justify me in forming a "new species." But I w
like to be thought to have failed to recognize that in the
nation of the homogenetic and the homoplastic factors of sp
have at present no criterion other than what even a friend
might call our ignorance. Chorology and Palæontology
to do for species what Comparison and Embryology are
organs.

6. Notes on the Natural History of Franz-Josef I observed in 1881–82. By W. H. Neale, M.B., Officer of the 'Eira' Expedition. (Communic Prof. Newton.)

[Received October 25, 1882.]

On July 25th, 1881, the 'Eira' expedition reached G
Franz-Josef Land. At Cape Crowther and Cape Grant
large loomeries; a short distance up the bay, on the w
many Rotges had their young among the basaltic colum
lofty cliffs. On the east side, near the head of Gray Bay, th
a good number of Snow-birds and Dovekies building, but
for any one to climb and obtain the eggs.

At Cape Stephen there was a large loomery; and at Cap
there were a few Looms, a good number of Rotges and Dove
some Snow-birds.

At Bell Island the same species were also seen; and on t
side there was a large loomery, and a great number of Ki
nests, also Dovekies, Rotges, Snow-birds, and Burgomasters.

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[1] 'Animal Life,' p. 462.

Geese and Brent Geese were seen and shot on the cliffs 700 feet above sea-level; but no nests were seen.

At Cape Flora there was a very large loomery, also many Dovekies, Rotges, Kittiwakes, Snow-birds, and Burgomasters. On the lowland Snow-Buntings and Sanderlings were seen, but no nests were found.

The Looms lay their eggs on the bare rocks. The Dovekies and Rotges lay them in the crevices of the rocks. The Kittiwake makes a nest of mud and moss. The Snow-bird makes a rudimentary nest of moss and a few feathers; but it is of no definite shape. Each species seems to occupy a separate part of the cliff; the Kittiwakes generally build with the Looms, but always on the lowest shelves.

The Rotges and Dovekies left about the first week in September; Looms were very scarce after September 10th. On September 22nd a note in my diary says that a few Burgomasters, Snow-birds, Mollies, Kittiwakes, Eider Ducks, Brent Geese, Snow-Buntings were still seen, but getting very scarce, and that by the end of the month a bird was a sight seen only very rarely. On October 13th two or three young Snow-birds and occasionally a Molly or Burgomaster were still seen hovering around the meat outside the house; and even on October 28th a few Snow-birds, Mollies, and Burgomasters came and fed on the remains of a Walrus, and remained a day or two hovering about; but after November 1st I never saw a bird at all.

On February 8th, 1882, a Snowy Owl was seen; the first bird to arrive. On February 18th two or three flocks of Dovekies were seen flying to the N.W.; and on the 20th we saw a great number in the water.

On March 2nd a lane of water opened out, close to the ground-ice; and it was crowded with Rotges and Dovekies. March 9th, the first Loom was seen; but it was not until nearly the end of March that they began to settle on the rocks; and then they would only stop for a few hours, and go away for four or five days. We were not able to get up the cliff and shoot any until April 16th.

April 20th, a Snow-bird was seen, also a Falcon Hawk. April 22nd, two Burgomasters were seen. April 24th, Mollies were seen. May 6th was the first time Kittiwakes were noticed; and the small land-birds were seen about that time.

The Looms did not begin to sit on the cliffs until about June 10th; after that date the females remained almost always on the rocks, keeping their places, ready for laying; and on June 20th three Loom's eggs were obtained; no other eggs were seen or obtained. Although a great many Geese used to come on the lowland near the pond, I never could find any signs of a nest.

The following is a list of the birds seen on the land either in 1881 or 1882:—

Loom (*Uria brunnichi*).
Rotge (*Mergulus alle*).
Dovekie (*Uria grylle*).
Molly (*Procellaria glacialis*).
Snow-bird (*Pagophila eburnea*).
Burgomaster (*Larus glaucus*).

November	1881	2 Bears.
December	„	
January	1882	4 Bears. 3 Walrus.
February	„	1 Bear.
March	„	8 Bears.
April	„	4 Bears. 50 Looms.
May	„	3 Bears. 370 Looms.
June	„	1 Bear. 5 Walrus. 250 Looms.
July	„ (During boat-journey.)	2 Bears.

On nearing Cape Crowther in July 1881, Walruses were seen on loose pieces of ice in great numbers; sometimes twenty or more were counted lying huddled up on one small piece. By going quietly in a boat you could get within 20 or 30 yards of them before they took much notice of you; but after the first shot was fired they tumbled into the water, and would go swimming about and barking round the boat, but never attacked us.

In September we saw great numbers of Walruses on the loose ice near the land; near Bell Island they were in great quantities; and off Cape Flora they were in great schools in the water. On October 28th five Walruses were shot on the edge of the ground-ice in front of our hut; there were also great numbers in the water at that time of the year. Up to the end of February Walruses were constantly seen swimming about in the water; and on January 24th three were shot at the edge of the ground-ice near the hut. In March the land-floe formed, and no open water existed within 7 or 8 miles of the land; but on going up the hill, Walruses could be seen by means of a glass swimming in the water.

On June 13th a strong N.W. gale broke up the land-floe; and on June 15th five Walruses were shot on the loose ice in the Sound.

The Walruses never left the country; and we never saw any signs of their taking the land. No remains of bones were seen anywhere on the land.

White Whales and Narwhals were seen in great numbers in September and October travelling S.E.; and in June some large schools were seen travelling westward and north-west.

Foxes (*Canis lagopus*) were constantly troubling us during the winter; they would come close up to the house, and soon got so tame that it was difficult to frighten them away from our blubber. We shot one White Fox (female) and a Grey Fox (male) during the winter. One or two Grey Foxes were seen during the winter with patches of white on them. No Black Fox was seen. In the autumn the Foxes were very quick in catching the Looms, especially the young ones, when they were first brought down to the water. Two or three Foxes would keep near the edge of a hole of water and kill Looms; they would then carry them up a few hundred yards on land, where they were relieved by other Foxes, who carried t up some distance, and then deposited them, for others to carry t to some place in the cliff; but we could never manage to find their storehouse.

7. On the Mollusca procured during the 'Lightning' 'Porcupine' Expeditions, 1868–70. (Part V.[1]) B Gwyn Jeffreys, LL.D., F.R.S., F.Z.S.

[Received November 1, 1882.]

(Plates XLIX., L)

Since the publication of the last part of this memoir I have, thro the kindness of several eminent palæontologists in Italy, had an portunity of examining their rich collections of Subapennine Sicilian Tertiary shells, and of carefully comparing them with t living analogues. This kind of study is indispensable to all zo gists in every department; and it teaches us at least two import facts, viz., 1st, the exact concordance in the most minute particu of so many species in their fossil and recent state, notwithstand the lapse of the enormous and incalculable time which has in vened; and 2nd, the extensive changes which have taken p during the same period between the depth of the ocean and height of land in the North-Atlantic area. The latter fact been demonstrated in a short paper which I contributed to Geological Society in 1880, "On the Occurrence of Marine Sh of existing Species at different heights above the present Leve the Sea," and which has reference to the present work.

The Expedition made this summer in the French vessel ' Travailleur' for exploring the depths of the Lusitanian seas fo third time, as well as of the seas lying between Cadiz, the Cana Madeira, and the Azores, has been most successful and producti and I have been indebted to the obliging favour of my friend Paul Fischer, for the opportunity of examining the interes Mollusca which were thus procured. The complete investigatio the Mollusca in even this comparatively limited area must be exhaustible. What shall we say then to the investigation of all various and hitherto unknown fauna which inhabit the depth every ocean throughout the whole world!

I will now continue my account of the Mollusca from 'Lightning' and 'Porcupine' Expeditions.

Class SOLENOCONCHIA.

Family Dentaliidæ.

1. Dentalium dentalis, Linné.

D. dentalis, L. S. N. p. 1263; G. B. Sowerby, Thes. Co pl. ccxxiv. f. 24, 27.

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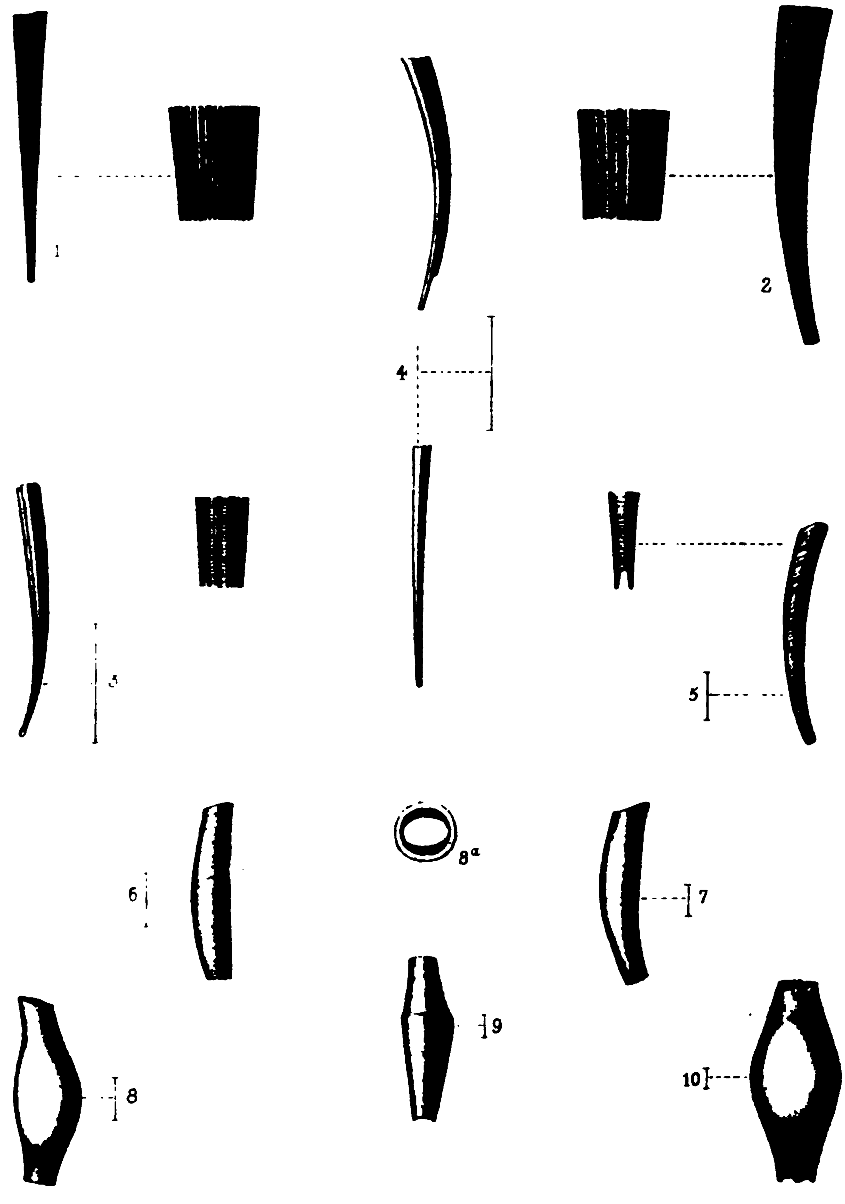
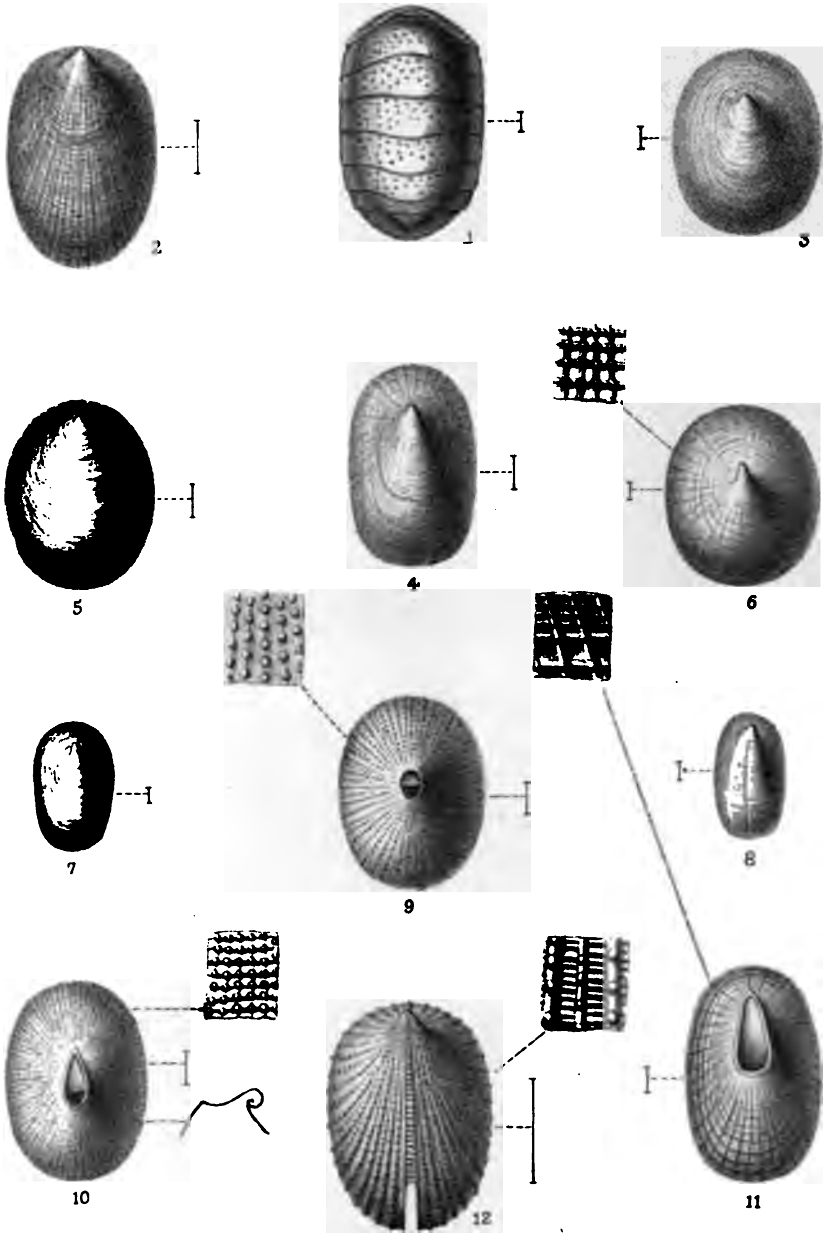
[1] For Part I. see P. Z. S. 1878, p. 393; for Part II. see P. Z. S. 1879, p. for Part III. see P. Z. S. 1881, p. 693; and for Part IV. see P. Z. S. 1881, p.



C. Berjeau del. et lith.

Hanhart imp.

MOLLUSCA OF THE "LIGHTNING" AND "PORCUPINE" EXPEDITIONS.



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Hanhart imp

MOLLUSCA OF THE "LIGHTNING" AND
"PORCUPINE" EXPEDITIONS.

'Porcupine' Exp. 1870: Atl. St. Vigo B., Tangier B.; Med. Cartagena B., 50, G. Bona, Benzert Road, G. Tunis, Adventure Bank.

Distribution. Finistèrre to the Archipelago and Sea of Marmara, Adriatic, Morocco, off Cape of Good Hope ('Challenger' Exp.), Canary Isles and Madeira; 0–150 fms. The Irish and Cornish localities mentioned in 'British Conchology,' iii. pp. 196 & 197, are doubtful, although it is not improbable that this species may be found there as well as on the opposite coast of France. Mighels, in his 'Catalogue of the Shells of Maine,' gives "*D. dentale*," saying that a specimen had been taken from the stomach of a haddock caught far out at sea in very deep water. It is more likely to have been the *D. striolatum* of Stimpson.

Fossil. Upper Tertiaries: Red and Coralline Crag, Antwerp, S. France, Italy, Morea, Archipelago. Post-tertiary: S. France.

I have noted 18 synonyms, the principal being *D. novemcostatum* of Lamarck and *D. costatum* of J. Sowerby. *D. striolatum* of Risso is a variety, and must not be mistaken for Stimpson's species. The specific names *dentalis* and *entalis* are not adjectives.

2. DENTALIUM PANORMITANUM (*panormum*), Chenu.

D. panormum, Chenu, Ill. Conch. t. 6. f. 13 (1842–47); G. B. Sowerby, Thes. Conch. pl. ccxxiv. f. 18.

'Porcupine' Exp. 1869, St. 1, 45*a*, 45*b*. 1870: Atl. C. Sagres, 36; Med. Capo de Gata, off Jijeli, 55, Adventure Bank, 58.

Distribution. Bay of Biscay ('Travailleur' Exp. 1880), Mediterranean and Adriatic; 30–195 fms.

Fossil. Upper Tertiaries: Antwerp Crag, Italy and Sicily.

Having examined and compared an extensive series of specimens from various places, I have come to the conclusion that, according to the received notions of a species, this must be considered distinct from *D. dentalis* and not merely a variety. Independently of the much greater length, the ribs are finer and far more numerous and regular, and they are extremely slight or become mere striæ on the anterior part or in front. The shell is also more tapering and proportionally narrower. It attains the length of 3 or 4 inches. Some specimens have the same pipe at the posterior extremity as in *D. dentalis*.

It appears to be *D. pseudo-antalis* of O. G. Costa (but not of Lamarck), *D. pseudo-entalis* of Scacchi (not of Deshayes), and *D. lessoni* of G. B. Sowerby (not of Deshayes) in part, *D. arguticosta* of Brugnone, and *D. semiclausum* of Nyst. As it has been in all probability confounded by other authors with *D. dentalis*, it is almost impossible to disentangle the synonymy of both these species.

3. DENTALIUM TARENTINUM, Lamarck.

D. tarentinum, Lam. An. s. Vert. v. p. 345, var. B: B. C. iii. p. 195; v. p. 197, pl. lv. f. 2.

'Porcupine' Exp. 1869, St. Galway B.

Distribution. West of Ireland, Holyhead, Cardigan B., and Belgium to the Adriatic, and throughout the Mediterranean to Smyrna; 0–543 fms.

Fossil. Miocene: Belgium, Piacentino and Parma. Upper Tertiaries: S. France, Italy. Post-tertiary: Ireland, Lancashire, Cheshire, S. France, and Tuscany.

Synonyms several, including *D. fasciatum* and perhaps *D. nebulosum* of Gmelin, and the *D. entalis* of most continental writers as well as of E. Forbes. As fossil it is *D. fusticulus* of Brugnone. Da Costa's name *vulgare* is certainly prior to Lamarck's name; but it would be inconvenient now to substitute it for *tarentinum*, which has been for between sixty and seventy years accepted and used by nearly every conchologist.

The stomach of this *Dentalium* is a repertory of littoral Foraminifera. It is not, like *Spatangus* or *Synapta*, an indiscriminate swallower of sand, but a fastidious Pig from the herd of Epicurus, luxuriously picking out the choicest morsels with its extensile and delicate captacula. Adriatic specimens of the shell collected by Professor Stossich are 2¼ inches in length and very fine.

4. DENTALIUM CAPILLOSUM, Jeffreys. (Plate XLIX. fig. 1.)

D. capillosum, Jeffr. in Ann. & Mag. N. H. Feb. 1877, p. 153.

'Porcupine' Exp. 1879: St. 47. 1870: Atl. 13, 16, 17.

Distribution. G. Mexico, off Bahia Honda (*Pourtales*), 'Challenger' Exp., off the Azores, 'Valorous' Exp.; 418–1785 fms.

Differs from *D. tarentinum* in being proportionally narrower and more uniformly cylindrical, straighter and not abruptly curved towards the point, and in the close-set striæ which completely and regularly cover every part of the shell, instead of being much finer on the smaller or posterior part. Fragments from the 'Valorous' Expedition show that it grows to a much larger size than any other North-Atlantic species. In the 'Travailleur' Expedition of 1882, several living specimens were dredged between Lisbon and the Canaries, of an extraordinarily large size and thickness, and having a long terminal slit.

5. DENTALIUM CANDIDUM, Jeffreys. (Plate XLIX. fig. 2.)

D. candidum, Jeffr. in Ann. & Mag. N. H. Feb. 1877, p. 153.

'Porcupine' Exp. 1869: St. 16, 21, 23, 23*a*, 28, 31, 37, 38.

Distribution. 'Valorous' Exp.; 410–1750 fms.

Some fragments are of an extraordinary thickness.

6. DENTALIUM AGILE, M. Sars.

D. agile (M. Sars), G. O. Sars, 'On some remarkable forms of Animal Life from the great deeps off the Norwegian coast,' i. 1872, p. 31, pl. iii. f. 4–15.

'Porcupine' Exp. 1869: St. 3, 5, 6, 7, 11, 13, 14, 15, 36, 39, 41, 45, 65. 1870: Atl. 1, 2, 3, 3*a*, 13, 16, 17 (very thick), Setubal B., off C. Espichel, 22, 24–34; Med. 40, 55, Adventure Bank.

Distribution. Loffoden I. to Bergen coast (*Sars* and others), Bay of Biscay ('Travailleur' Exp.), Mediterranean (*Spratt* and others), Adriatic (*Stossich*), Azores ('Josephine' Exp.), Canaries ('Challenger' Exp.), G. Mexico (*Dall*), New England and Maine (*Verrill & Packard*); 30–1963 fms.

Fossil. Upper Tertiaries: S. Italy, Sicily, and Rhodes.

Prof. G. O. Sars was right in distinguishing this species from *D. striolatum*; and I was wrong in uniting them, although other naturalists may not be satisfied. The shell is usually smooth, but sometimes more or less strongly striated lengthwise towards the point. A specimen from the west of Ireland is more than 3 inches long. See also my remarks in the Ann. & Mag. N. H. for Feb. 1877 and July 1882.

It is the *D. incertum* of Philippi but not of Deshayes, *D. striatum* of Scacchi, and *D. lacteum* of O. G. Costa but not of Deshayes.

7. DENTALIUM STRIOLATUM, Stimpson.

D. striolatum, Stimps. Proc. Boston Soc. Nat. Hist. 1851, p. 114.

'Lightning' Exp., St. 5, 7.

'Porcupine' Exp. 1869: St. 3, 23*a*, Little Minch.

Distribution. From Spitzbergen and the Faroe Islands to the Bay of Biscay and the Azores, the Mediterranean, as well as all along the eastern coasts of North America from Newfoundland to Maine, off Valentia with *D. entalis*; 10–570 fms.

Fossil. Pliocene: Sicily. Post-tertiary: Norway, Scotland, North of England; 0–1360 ft.

As Mr. Norman justly remarked in the 'Journal of Conchology' for Jan. 1879, it is very difficult to distinguish some Norwegian specimens of *D. striolatum* from *D. entalis*. I will not say they may not be the same species. The principal difference seems to consist in the present species being less regularly cylindrical and being abruptly pinched up near the point, as well as in the longitudinal striæ at that end. It is unmistakably the same species as *D. abyssorum* of M. Sars, 1858, as he afterwards admitted. Besides the latter synonym, it is the *D. brevifissum* of Brugnone, but not of Deshayes or Nyst. Professor Whiteaves, in 1874, regarded *D. attenuatum* of Say as identical with *D. dentalis* of Gould and *D. abyssorum* of Sars. Judging from specimens named by Professor Verrill "*Dentalium occidentale*, Stimpson" (*D. dentalis*, Gould), this is another synonym, the specimens belonging to a more strongly ribbed variety of the present species. Not *D. striolatum* of Risso, 1826, which is a variety of *D. dentalis*.

8. DENTALIUM ENTALIS, Linné.

D. entalis, L. S. N. p. 1263: B. C. iii. p. 191, pl. v. f. 1; v. p. 197, pl. lv. f. 1.

'Lightning' Exp., St. 2, 3, 4, 5.

'Porcupine' Exp. 1869: St. 1, 2, 6, 9, 13, 14, 18, 24, 25, 33, 35, 45*a*, 45*b*, 64, 68, The Minch, Little Minch. 1870: Atl. 30.

Distribution. Iceland, Northern Russia, and Scandinavia to Corunna, Maine, Vancouver I.; 4–200 fms. It is much more com-

3. SIPHODENTALIUM LOFOTENSE, M. Sars.

Siphonodentalium lofotense, M. Sars, Christ. Vid. Selsk. Forh. 1864, p. 297, t. vi. f. 29–33: B. C. v. p. 195, pl. ci. f. 2.

'Porcupine' Exp. 1869: St. 2, 6, 10, 14, 16, 18, 23, 25, 28, 1870: Atl. 9, Vigo B., 26–30; Med. 50, 55.

Distribution. Norway, Shetland and the Hebrides, Bay of Biscay, throughout the Mediterranean from Marseilles to the coast of Syria, 'Valorous' Exp., New England; 30–1750 fms.

Fossil. Pliocene: Calabria and Sicily.

An undescribed species, allied to *S. lofotense*, was dredged by the late Mr. McAndrew in the Gulf of Suez; it differs in the mouth being encircled by a rim and in the base being bifid instead of merely notched.

4. SIPHODENTALIUM QUINQUANGULARE, Forbes.

Dentalium quinquangulare, Forb. Rep. Æg. Inv. p. 188.

Siphonentalis tetragona, G. O. Sars, Moll. reg. arct. Norv. p. 105, t. 20. f. 13, *a–c*.

'Porcupine' Exp. 1869: St. 3, 14, 15, 17, 38. 1870: Atl. 1, 2, 3, 3*a*, 6, 8, 9, 13, 17*a*, 24–34; Med. 45, 55, Adventure Bank.

Distribution. Norway, Bay of Biscay and N. Spain, Mediterranean from Algiers and Marseilles to the Ægean, Jamaica, Barbadoes, var. off Culebra I. ('Challenger' Exp.); 5–650 fms.

Fossil. Pliocene: S. Italy and Sicily.

I do not consider this the *Dentalium tetragonum* of Brocchi or a variety of it, to which his and Gmelin's *D. sexangulum* (not *D. sexangulare* of Lamarck and Deshayes) apparently belongs. Specimens of Brocchi's species from the Subapennine Tertiaries, for which I am indebted to the kindness of Professor Bellardi and the late Signor Lawley, are clearly a species of *Dentalium*, and have the base (or apex, whichever it may be called) truncated and fitted with a central short pipe as in *D. dentalis* and allied species. Some of these specimens are four-angled, while others have 5 or 6 angles.

I am not at all satisfied with the generic place of this peculiar shell. The sculpture is that of most species of *Dentalium*, and the fry have also a bulbous or pear-shaped base; but the terminal notches, usually one on each side, agree with those in most species of *Siphodentalium*. Some Norwegian specimens have five notches, and are jagged like *S. vitreum*. If the position of these terminal notches or slits constitutes a generic character, *D. subterfissum* and *D. rubescens* ought to be separated from *Dentalium* with much greater reason than *Antalis*. Although the present species is so common in Norway and the west of Ireland, as well as southwards to the Mediterranean, it has strangely enough not yet occurred in Shetland, where the conditions of habitability are similar.

5. SIPHODENTALIUM VITREUM, M. Sars.

Dentalium vitreum, M. Sars, Nyt Mag. Naturvid. 1851, Bd. vi. p. 178 (*Siphonodentalium*), 1858.

D. lobatum, G. B. Sowerby, jun., Thes. Conch. 1866, vol. iii. p. 100, fig. 44.

'Lightning' Exp., St. 1.

'Porcupine' Exp. 1869: St. 19, 42, 89. 1870: Atl. 17.

Distribution. Arctic ocean from Spitzbergen and Novaia Zemblia to Finmark, 'Valorous' Exp., G. St. Lawrence to southern coast of New England; 15–1750 fms.

Fossil. Miocene: Vienna Basin (*Hörnes*)? Post-tertiary: Norway, 82° 30′ N. lat. (*Feilden*), Canada; 4–240 ft.

Not *Dentalium vitreum* of O. G. Costa.

DISCHIDES BIFISSUS, S. V. Wood.

Dentalium bifissum, S. V. Wood, (Publ. Pal. Soc.) Crag Moll. i. p. 190, t. xx. f. 3, *a–b*.

'Porcupine' Exp. 1870: Atl. St. Vigo B., Setubal B.; Med. 50, 50*a*, Benzert Road, Adventure Bank.

Distribution. G. Gascony, Mediterranean from Gibraltar to Sicily, Morocco, Canaries; 5–180 fms.

Fossil. Pliocene: Coralline Crag, Italy. Post-tertiary: Selsea.

BODY whitish, gelatinous: *mantle* rather thick, forming a collar round the front opening of the shell: *captacula* issuing from within the mantle, numerous, capable of so great an extension as to exceed the shell in length; stalks very slender; terminal bulbs oval: *foot* cylindrical and narrow, protruded from the middle of the mouth as from a sheath; it is occasionally thrust out in a darting manner and suddenly withdrawn, and so swiftly that the point of the foot could not be observed; the foot is usually curved towards the point: *anal tube* protruded beyond the narrower end or extremity of the shell; it consists of an outer and inner part, the latter being folded to suit the slit on each side: *gills* rather short, of a brownish colour.

There are several useless synonyms. This species appears to be *Dentalium coarctatum* of Deshayes, but not of Lamarck. It was erroneously considered by me *Dentalium olivi* of Scacchi, for which see *Cadulus*. A species of *Dischides*, dredged by the late Admiral Sir E. Belcher in the North Pacific, somewhat resembles the present species, but is proportionally wider and the terminal slits are shorter and more open. The generic character of *Dischides* is the bilateral position of the terminal slits. *Gadus bilabiatus* and *G. parisiensis* of Deshayes, Eocene fossils, are not unlike *D. bifissus* in shape; but the terminal point or base is jagged as in *Siphodentalium vitreum*, and the slit is much shorter. Besides, *Gadus* has been very long and notoriously used in Ichthyology.

1. CADULUS OLIVI, Scacchi.

Dentalium olivi, Sc. Not. foss. Gravina (Ann. Civ. 1835), p. 56, t. 2. f. 6, *a b*.

'Porcupine' Exp. 1869: St. 17. 1870: Atl. 9.

Distribution. Florö, Norway, a fragment (*Norman*), Bay of l Palermo (*Monterosato*), 'Valorous' Exp., New England (1 80–1450 fms.

Fossil. Pliocene: Italy.

C. pandionis of Verrill and Smith from New England. Nyst considered *Dentalium gadus* of Montagu identical with *D. coarctatum* of Lamarck and *D. "Olivii"* of Scacchi. This was clearly a mistake, all the three shells being quite different, and Lamarck's being a well-known species of *Ditrypa* and belonging to the Annelida. The present species is apparently *Siphonodentalium hyalinum* of Brugnone. It may be *D. ventricosum* of Bronn. Calcara referred *D. olivi* to *D. coarctatum* of Brocchi, which is Lamarck's species. According to Fischer the latter is probably the same as Montagu's *D. gadus*. I proposed in 1869 the generic name *Loxoporus*, if Philippi's name *Cadulus* were not applicable to this group of shells; and later in the same year Stimpson proposed the name *Helonyx*. This genus differs from *Siphodentalium* in the constriction of the mouth, and in the middle portion of the shell being more or less swollen. In *C. olivi*, the point or base (if we regard the shell as an inverted narrow siphon) has several slits, as in *S. vitreum*; but the mouth is thickened or encircled with a rim, and is obliquely truncated. It is variable in size and comparative slenderness, both in the living and fossil states.

2. CADULUS CYLINDRATUS, Jeffreys. (Plate XLIX. fig. 6.)

C. cylindratus, Jeffr. in Ann. & Mag. N. H. Feb. 1877, p. 158.

'Porcupine' Exp. 1869: St. 20, 28, 30, 31.

Distribution. 'Valorous' Exp., Bay of Biscay ('Travailleur' Exp. 1880); 652–1450 fms.

3. CADULUS GRACILIS, Jeffreys. (Plate XLIX. fig. 7.)

C. gracilis, Jeffr. in Ann. & Mag. N. H. Feb. 1877, p. 157.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17*a*.

Distribution. 'Valorous' Exp., Bay of Biscay ('Travailleur' Exp. 1880); 690 fms.

4. CADULUS SUBFUSIFORMIS, M. Sars.

Siphonodentalium subfusiforme, M. Sars, Vid. Selsk. Forh. 1864, p. 21, t. vi. f. 36–44.

'Porcupine' Exp. 1869: St. 10. 1870, Atl. 2.

Distribution. Norway, Shetland, Bay of Biscay ('Travailleur' Exp. 1880), Palermo (*Monterosato*, as *C. abyssicola*); 40–650 fms.

Fossil. Miocene: Vienna Basin (*Hörnes*)? Post-tertiary: Barholmen near Christiania (*Crosskey & Robertson*); 30 ft.

I had mistaken the present species for that to which Monterosato afterwards obligingly gave my name. In *C. subfusiformis* the mouth is circular and abruptly truncated; in *C. jeffreysi* the mouth is roundish-oval and obliquely truncated. Professor G. O. Sars first called my attention to this difference. Both species occur on the western coast of Norway as well as in Shetland.

5. CADULUS PROPINQUUS, G. O. Sars.

C. propinquus, G. O. Sars, Moll. reg. arct. Norv. p. 106, t. 20. f. 15, *a–b*.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17 *a*.

Distribution. Norway, Bay of Biscay ('Travailleur' Exp. 1880), New England (*Verrill*)?; 100–450 fms.

Professor Verrill's notice and figures of this species, which are given with his usual care and accuracy, differ so much from European specimens, that I cannot satisfactorily quote his habitat. *C. propinquus* is smaller and less swollen than *C. jeffreysi*, not so contracted at the point; and especially the mouth is not obliquely truncated, but circular.

6. CADULUS JEFFREYSI, Monterosato.

C. subfusiformis, B. C. v. p. 196, pl. ci. f. 3.

Helonyx jeffreysii, Monterosato, 'Poche note sulla Conchiologia Mediterranea,' 1875, p. 10.

'Porcupine' Exp. 1869: St. 1, 2, 3, 4, 6, 9, 10, 14, 16, 22, 23*a*, 25, 27–30, 61, 89. 1870: Med. 50, Adventure Bank.

Distribution. Norway (and var. *tumidula*, as *C. tumidosus* of G. O. Sars, not of me), Shetland, Valentia (west of Ireland), Bay of Biscay (var. *tumidula*), Mediterranean from Marseilles to the Ægean, Canary I. ('Challenger' Exp.), Josephine Bank and Azores ('Josephine' Exp.), New England (*Verrill*); 40–1125 fms.

Fossil. Pliocene: Calabria and Sicily.

C. diploconus, Seguenza. Although it somewhat varies in size, the shell is always much larger and more swollen than *C. subfusiformis*, to which I had erroneously referred it.

7. CADULUS TUMIDOSUS, Jeffreys. (Plate XLIX. fig. 8.)

C. tumidosus, Jeffr. in Ann. & Mag. N. H. Febr. 1877, p. 156.

'Porcupine' Exp. 1869: St. 39. 1870: Atl. 16, 17, 17*a* (and var. *minor*), 22, 24, 31–34 (var. *minor*).

Distribution. 'Valorous' Exp., Bay of Biscay ('Travailleur' Exp.), Canaries ('Challenger' Exp.); 1093–1450 fms.

Fossil. Pliocene: Messina.

Some specimens are faintly or indistinctly striated lengthwise. In all probability many of the species described by Mr. Dall from the 'Blake' dredgings in the Gulf of Mexico and Caribbean Sea, as well as of those described by Mr. Watson from the 'Challenger' Expedition, may ultimately prove to be united with some of the species which I have described. It is very difficult to define the line of variation, and much more that of specific distinction. At all events the above may be considered "forms" if not species.

8. CADULUS AMPHORA[1], Jeffreys. (Plate XLIX. fig. 9.)

SHELL resembling in shape an ancient wine-vessel without handles, bulging towards the middle, gently curved, narrowing towards each end but more contracted at the base or point, rather solid, glossy, and opaque: *sculpture* consisting of a slight but distinct keel which encircles the shell on the upper two fifths of its length; that part is somewhat excavated or flattened; no striæ of growth are perceptible:

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[1] Like an amphora.

that there is a real affinity between *Chiton* and *Patella*, and that *Chiton* does not materially differ from other mollusks. Mr. Dall also regards the Chitons and Limpets as closely allied. See his exhaustive and valuable remarks on the morphology and classification of the Chitons in the 'Scientific Results of the Exploration of Alaska' (1879), in which he proposed no fewer than 33 genera distributed into 9 groups. Dr. McIntosh has noticed that Chitons scoop out sandstone like Limpets. Specimens occurred on the coast of Bohuslän, in 12 fathoms, on the leaves of *Laminaria saccharina*.

2. CHITON DISCREPANS, Brown.

C. discrepans, Brown, Ill. Conch. p. 65, pl. xxi. f. 20: B. C. iii. p. 214; v. p. 198, pl. lv. f. 4.

'Porcupine' Exp. 1870: Atl. St. Gibraltar B., with *C. fascicularis*.

Distribution. Norway and Sweden (*Lovén*)?, Cornwall and Channel Isles to Mogador, Mediterranean and Adriatic; 0–25 fms.

Fossil. Pliocene; S. Italy. Post-tertiary: Selsea.

There are a few obsolete synonyms.

B. *Acanthopleura*, Guilding.

Girdle spinous, without tufts.

3. CHITON MENDICARIUS, Mighels.

C. mendicarius, Migh. Boston Journ. Nat. Hist. 1841, i. p. 49; 1842, iv. p. 42, pl. 4. f. 8.

C. Hanleyi, B. C. iii. p. 215; v. p. 198, pl. lv. f. 5.

'Porcupine' Exp. 1869: St. 2, 65. 1870: Atl. 24 (plate only).

Distribution. Loffoden and Faroe I. to South Devon, Mediterranean (*Monterosato*), Caribbean Sea (*Petit*), eastern coasts of North America; 8–300 fms.

Fossil. Post-tertiary: Norway.

C. Nagelfar of Lovén and *C. abyssorum* of M. Sars appear to be this species of unusually large size. The late Mr. Barlee dredged in Shetland a specimen an inch long. My Piedmontese shell which I named *C. Hanleyi* turned out to be the young of *C. caietanus*. *C. strigillatus* of S. Wood, a Coralline-Crag shell, is more probably *C. apiculatus* of Say, which is also a North-American species; but the fossil is only known from disjointed plates. The "Crag" Mollusca include many North-American species. The inside of each plate in the middle is strengthened by a thick bow-shaped rib.

C. *Lepidopleurus*, Leach.

Girdle irregularly granular.

4. CHITON CAIETANUS, Poli.

C. caietanus, Poli, Test. utr. Sic. i. p. 10, t. iv. f. 1, 2.

'Porcupine' Exp. 1870: Med. Algesiras B. (young).

Distribution. C. Croisic (*Cailliaud*), C. Breton (*de Folin*), S (*McAndrew* and others), Mediterranean and Adriatic (*Poli* others) to Ægean (*Forbes*); 5–20 fms.

5. CHITON CINEREUS, Linné.

C. cinereus, L. S. N. p. 1107: B. C. iii. p. 218; v. p. 198, p f. 2.

'Lightning' Exp. St. 4, 5.

'Porcupine' Exp. 1869: St. 2, Lough Foyle. 1870: At (plate).

Distribution. Greenland (*Fabricius*)?, Iceland, Faroe I., Fin to Vigo Bay; 1–150 fms. Apparently not Mediterranea Adriatic.

Fossil. Pliocene: Sicily (*Monterosato* and *Tiberi*). Post-tert Norway and Scotland; 0–80 ft.

One of the synonyms is *C. asellus* of Spengler.

6. CHITON ARCTICUS, G. O. Sars.

Lepidopleurus arcticus, G. O. Sars, Moll. reg. arct. Norv. p. t. 7. f. 7, *a–h*.

'Lightning' Exp. St. 3, 4.

Distribution. Spitzbergen, Greenland as *C. cinereus* (*M.* probably, Finmark and Vadsö (*G. O. Sars*); 20–100 fms.

Fossil. Post-tertiary: Norway, as *C. cinereus* (*M. Sars*) prob

This differs from the white variety of *C. cinereus* in its paratively greater length and more raised or arched form, in th distinct or regular catenation of the granules which cover the face, and in the prominence of the lateral areas.

7. CHITON ALVEOLUS, M. Sars.

C. alveolus (Sars MS.), Lovén, Ind. Moll. lit. Scand. occ. p. 27.

Lepidopleurus alveolus, G. O. Sars, Moll. reg. arct. Norv. p. t. 7. f. 3, *a–c*.

'Porcupine' Exp. 1870: Atl. St. 1.

Distribution. Norway, Bay of Biscay ('Travailleur' Ex 120–664 fms.

The late Professor Sars, in his remarks on the occurrenc animal life in the depths of the sea, 1868, referred this species o to *C. cancellatus*; but *C. alveolus* is larger and longer or oblong, and it has a different sculpture.

8. CHITON RARINOTA[1], Jeffreys. (Plate L. fig. 1.)

SHELL oblong-oval, arched, rather thin and glossy: *plates* bro in the middle than at the sides; lateral areas indistinct: *sculp* consisting of white tubercles, which are few in number and irregul scattered; these are round in the middle of the shell, but bec more raised and oval at the sides; under a microscope can be detected numerous and close-set lines or striæ, which are arranged lengthwise: *colour* whitish: *beaks* none, except on the tail-plate, where they are nearly circular: *inside* glossy. L. 0·1, B. 0·05.

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[1] Having few marks.

'Porcupine' Exp. 1870: Atl. St. 3 *a*, 17. Two specimens.

Although this is a very small species, and might be regarded as the young of some other species, I must observe that I have carefully compared both specimens with the young of all other European species of *Chiton* known to me, and some specimens of which last mentioned species are much smaller than those which I have now described. The peculiar character of having so very few and scattered tubercles is not presented by any other of those species. The girdle is membranous and thin.

9. CHITON MARGINATUS, Pennant.

C. marginatus, Penn. Brit. Zool. iv. p. 71, t. xxxvi. f. 2; B. C. iii. p. 221; v. p. 199, pl. lvi. f. 5.

'Porcupine' Exp. 1870: Atl. St. Vigo B.

Distribution. Greenland (coll. Möller, in mus. Copenhagen), Faroe I., Norway to Mogador, Mediterranean and Adriatic, eastern and western coasts of North America; 0–40 fms.

Fossil. Pliocene: Sicily (*Monterosato*). Post-tertiary: Norway, Selsea; 0-100 ft.

C. cinereus of Laskey, Lowe, and Forbes and Hanley (not of Linné), *C. variegatus* of Philippi and other authors, and *C. dentiens* of Gould.

D. *Lophyrus*, Poli.

Girdle imbricated or regularly granular.

10. CHITON ALBUS, Linné.

C. albus, L. S. N. p. 1107: B. C. iii. p. 220; v. p. 199, pl. lvi. f. 3.

'Lightning' Exp., St. 1, 2, 5.

Distribution. Spitzbergen, Novaia Zemblia, Russian Lapland, White Sea, Finmark southward to Isle of Man, Faroe Isles, Iceland, Greenland, Wellington Channel, Behring Strait, eastern and western coasts of North America; 0–337 fms.

Fossil. Post-tertiary: Fort William.

Family II. PATELLIDÆ.

PATELLA VULGATA, Linné.

P. vulgata, L. S. N. p. 1258: B. C. iii. p. 236, pl. v. f. 3; v. pl. lviii. f. 1–4.

'Porcupine' Exp. 1869, St. Donegal B. 1870: Atl. Gibraltar B.

Distribution. Throughout the western coast of Europe from the Faroe Isles and Bergen to Gibraltar, as well as the Mediterranean and Adriatic; between tide-marks and even above high water, on rocks and stones. C. Verd I. (*de Rochebrune*). Not Arctic, nor Asiatic, nor American.

Fossil. Pliocene: Red Crag. Post-tertiary, especially in raised sea-beaches: Scandinavia, Great Britain and Ireland, France, and Italy; 0–1360 ft.

An extremely variable species, as regards shape, size, position of the apex, sculpture, colour, inner coating, habitat, and every other characteristic than that of being conical. All the North-Atlantic so-called species, except *P. ferruginea* or *safiana*, but including the varieties noticed in 'British Conchology' and *P. lusitanica* of Gmelin or *punctata* of Lamarck, run one into another by insensible gradations.

Although the following more properly relates to the habits of the Mammalia than to those of the Mollusca, it is not devoid of interest in this place. In a letter from Dr. Fleming to Prof. Jamieson (Mem. Wern. Soc. 1823), he says that at Scalpa, "in the course of conversation with the keeper of the lighthouse Mr. Reid, a judicious observing man, I was informed that rats (the brown or Norway rat, which abounds in the Hebrides) after a shower go down upon the rocks, while the Limpets are crawling about, and by a sudden jerk with their noses detach them from the rocks for food. Should the first effort fail, another is never attempted against the same individual, now warned and adhering closely to the rock; but the rat proceeds instantly to others still off their guard, until enough of food has been procured." See also an interesting paper by Mr. J. Clark Hawkshaw on the habits of the Common Limpet in the 'Journal of the Linnean Society' (Zoology) for 1878.

As may be expected, the synonyms are numerous, and include *P. vulgaris* of Belon, whose name is older than that of Linné by about two centuries.

HELCION PELLUCIDUM, Linné.

Patella pellucida, L. S. N. p. 1260.

H. pellucidum, B. C. iii. p. 242, pl. v. f. 4; v. p. 199, pl. lviii. f. 1, 2.

'Porcupine' Exp. 1869: St. Donegal B. 1870: Atl. Vigo B.

Distribution. Iceland, Faroe I., N. Cape to Mogador, Mediterranean (*Linné*)? Antibes (*Martin*, f. *Petit*)?; 0–20 fms., usually on *Laminariæ*.

Fossil. Pliocene: Sicily (*Seguenza*). Post-tertiary: Norway, Scotland, and N. Ireland; 0–130 ft.

In the 'Philosophical Transactions' for 1696 Sir Robert Sibbald mentioned this as the "Oval Limpet" in his letter to Dr. Lister on Skye shells.

There are at least half a dozen synonyms. On the other hand, Cantraine thought it very possible that *Helcion pellucidum*, *Tectura virginea*, and *Gadinia gussoni* (the last being his *Patelloidea vitrea*) belong to one and the same species! Lamarck gives the type of the present genus (*Helcion pectinatum*) as Mediterranean on the authority of Born.

1. TECTURA VIRGINEA, Müller.

Patella virginea, Müll. Prodr. Zool. Dan. p. 237.

T. virginea, B. C. iii. p. 248; v. p. 200, pl. lviii. f. 4.

'Lightning' Exp., St. 4.

'Porcupine' Exp. 1869: Lough Foyle. 1870: Atl. Vigo B., 26 (var. *conica*), 31–34 (same var.); Med. 50, Adventure Bank, off Rinaldo's Chair.

Distribution. North Atlantic from Iceland and Norway to Madeira, Canaries, C. Verd I. (*de Rochebrune*), St. Helena (*Melliss*) !, Azores, Mediterranean to the Archipelago, and Adriatic; 0–150 fms.

Fossil. Miocene: Marne Vaticano (*Ponzi*). Pliocene: Red and Antwerp Crags, Italy, Rhodes. Post-tertiary: Scandinavia, Great Britain and Ireland, Italy; 0–460 ft.

For synonyms see 'British Conchology;' but this species is not the *Patella pileolus* nor *P. asmi* of Middendorff, ex vis. typ. With respect to the question as to the relative precedence in date of the generic name *Tectura* (or *Tecture*) and *Acmæa*, I would remark that part v. of the 'Zoologischer Atlas' of Eschscholtz (now before me), which contains a diagnosis of *Acmæa*, was published in 1833; *Tecture* was published in 1830. The Dorpat edition of the 'Atlas,' published in 1828, does not name any type or species.

An adult specimen dredged by Admiral Acton in the Bay of Naples from 60 fathoms has a completely spiral and persistent apex or nucleus. Some Mediterranean and Adriatic specimens have the same shape and coloured markings as those from the North Atlantic; and the position of the apex is very variable. I therefore cannot regard the *Lottia unicolor* of Forbes as a distinct species. Post-tertiary specimens are occasionally very large; one collected by Thudén in Sweden is two thirds of an inch long.

2. TECTURA FULVA, Müller.

Patella fulva, Müll. Prodr. Z. D. p. 237.

T. fulva, B. C. iii. p. 250; v. p. 200, pl. lvii. f. 5.

'Lightning' Exp.: St. 2, 5.

'Porcupine' Exp. 1869: 1, 6, 9, 68, Little Minch.

Distribution. Finmark to Cape Clear, near Heligoland (*Weinkauff*), Bay of Biscay ('Travailleur' Exp. 1881) !, off Tripoli ('Shearwater' Exp.) !; 10–487½ fms.

Fossil. Pliocene: Red Crag, and Sicily. Post-tertiary: Norway; 100–440 ft.

3. TECTURA RUGOSA [1], Jeffreys. (Plate L. fig. 2.)

SHELL oblong-oval, convex, rather thin, opaque and lustreless: *sculpture* a few slight and indistinct striæ which radiate towards the margin; these are crossed by much stronger, close-set, and lamellar or ridge-like striæ in the line of growth, which give a wrinkly appearance; the points of decussation are nodulous; the nucleus and upper part of the shell are quite smooth: *colour* whitish: *beak* somewhat incurved and overhanging the front margin:

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[1] Full of wrinkles.

mouth oblong-oval: *margin* entire: *inside* glossy, showing the i pression of the radiating striæ. L. 0·2, B. 0·15.

'Porcupine' Exp. 1870: Atl. St. 16. Three specimens.

This species differs from *T. fulva* in being more raised and oblo as well as in the peculiar sculpture and position of the beak.

4. TECTURA PUSILLA[1], Jeffreys. (Plate L. fig. 3.)

SHELL roundish-oval, somewhat depressed, rather thin, opaq and lustreless: *sculpture* extremely numerous, crowded and regul delicate, minute striæ, which radiate towards the margin as in oth species, and cover the whole surface: *colour* whitish: *beak* plac at less than one third from the front margin; it is slightly incurv and pinched-up; apex apparently deciduous: *mouth* roundish-ov *margin* thin: *inside* smooth and glossy: *scars* indistinct. L. 0·12 B. 0·1.

'Porcupine' Exp. 1870: Atl. St. 16, 17*a*. A few dead specime

5. TECTURA ADUNCA[2], Jeffreys. (Plate L. fig. 4.)

SHELL oblong, raised but contracted near the beak so as to ma the latter more prominent, rather thin, opaque and lustreles *sculpture*, several fine striæ which radiate towards the margin; mo of them are alternately larger and smaller; they do not extend the upper part of the shell: *colour* whitish: *beak* placed in fro about one third of the whole length; it is strongly incurved hooked, and has a subspiral and deciduous apex: *mouth* oblon *margin* thin, entire: *inside* smooth and glossy: *head-scar* sem circular. L. 0·2, B. 0·125.

'Porcupine' Exp. 1870, Atl. St. 17*a*. A single and imperf specimen, but characteristic. Mr. Dall has seen it, and says it probably his *Cocculina beanii*. I will, however, retain provisional the specific name which I have given.

Dall's species was dredged in the 'Blake' Expedition off t West Indies in 399–562½ fathoms, and by Professor Verrill off t coast of New England in 100–365 fathoms.

6. TECTURA GALEOLA[3], Jeffreys. (Plate L. fig. 5.)

SHELL resembling an ancient helmet or casque, strong a thick for its size, opaque and lustreless: *sculpture*, numerous a close-set fine and minute radiating striæ, which cover the whole the exterior; there are also occasional and well marked lines growth, which are somewhat crowded towards the margin: *colo* whitish: *beak* small, incurved, and pointed, placed very near t front margin and almost overhanging it: *margin* entire, compress and forming a rim on the front half: *inside* smooth: *scars* as *Lepeta cæca*. L. 0·225, B. 0·175.

'Porcupine' Exp. 1870: Atl. St. 24. A single specimen.

If the peculiar shape of this shell may be regarded as a gener character, I would suggest for it the name *Dallia*, as a mark of respe for the great malacologist Mr. Dall, who has examined my specime

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[1] Tiny.

[2] Hooked.

[3] A hollow vessel shaped like a helmet.

He says it is "not an Acmeid," and would place it near *Capulus*; but he qualifies his remark by saying that "it is barely possible it may be a *Cocculina*." He is an unquestionably good authority on this as well as other departments of the Mollusca; and I venture with much hesitation to differ from him.

ADDISONIA ECCENTROS, (EXCENTRICA) Tiberi.

Gadinia excentrica, Tib. in Journ. Conch. vi. p. 37, pl. ii. f. 6.

'Porcupine' Exp. 1870: Atl. St. 16; Med. Adventure Bank. Two specimens.

Distribution. Coral-fishery, Sardinia (*Tiberi*); a single specimen, with *Gadinia gussoni*.

I have made a slight change in the specific name by substituting a classical word for one which is not Latin.

This remarkable shell appears to be the *Addisonia paradoxa* of Dall (Proc. U.S. Nat. Mus. 1882, p. 405), which was dredged by Verrill off the New-England coast in 69–130 fathoms. Dall long ago pointed out that Tiberi's species was not a *Gadinia*. Tiberi's *G. compressa* (recent and fossil), of which through his kindness I possess specimens, is certainly a species of *Lepetella*, Verrill, and comes near *L. tubicola*, which has been lately found by G. O. Sars on the western coasts of Norway. *Addisonia* appears to be allied to *Pilidium*. See the above-cited 'Proceedings of the United-States National Museum' for Dall's excellent and elaborate paper on the families *Cocculinidæ* and *Addisoniidæ*, consisting of the genera *Cocculina* and *Addisonia*. The present species is not the *Patella excentrica* of Sandberger from the Mayence Basin.

Although the genera *Umbrella* and *Tylodina* (which are closely allied) have a patelliform shell, there is a peculiarity in that respect which connects them with *Aplysia* and the Nudibranchs, viz. in the spiral and heterostrophe nucleus. *Tylodina duebeni* of Lovén occurred at Stations 24 and 27 of the 'Porcupine' Atlantic dredgings in 1870. It seems rather strange that M. Gaston Moquin-Tandon, in his long and studiously exhaustive memoir on the *Umbrella* of the Mediterranean, did not notice this peculiarity, nor even assign or propose any place for that genus in the classification of the Mollusca, while he freely criticised all previous writers on the anatomy of the animal.

1. PROPILIDIUM ANCYLOÏDES, Forbes.

Patella ancyloides, Forb. in Ann. Nat. Hist. v. p. 108, pl. ii. f. 16.

Propilidium ancyloide, B. C. iii. p. 254, pl. vi. f. 1; (*P. ancyloïdes*) v. p. 200, pl. lviii. f. 7.

'Lightning' Exp., St. 5.

'Porcupine' Exp. 1869: St. 1, 6, 13, 14, 19. 1870: Atl. 16, 17, 17*a*; Med. Adventure Bank.

Distribution. 'Valorous' Exp., Loffoden I. to Galway coast, Kimmeridge B. Dorset (*Pleydell*)?, Naples (*Acton*), Trapani, Sicily (*Seguenza*); 10–1450 fms.

Fossil. Pliocene: Sicily. Post-tertiary: Christiania; 30–100 ft. *Rostrisepta parva* of Seguenza.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17*a*. Several
mens.

Distribution. 'Valorous' Exp., Bay of Biscay ('Travaill
Exp. 1881); 1003–1450 fms. Off Culebra I., Danish W. In
('Challenger' Exp.); 390 fms.

This is easily distinguishable from any species of *Fissurisept*
having a conspicuous and persistent spire, as well as in the shap
the septum.

The only difference between *Puncturella* and *Rimula* seem
consist in the comparative length of the slit. This is proportion
much longer in the young than in the adult of the typical spec
P. noachina.

2. PUNCTURELLA NOACHINA, Linné.

Patella noachina, L. Mant. Plant. p. 551.

Puncturella noachina, B. C. iii. p. 257, pl. vi. f. 3; v. p.
pl. lix. f. 1.

'Lightning' Exp.: St. 2, 4, 5, off the Faroe I.

'Porcupine' Exp. 1869: St. 6, 9, 13, 14 (and var. *princeps*;
var. *levior*, laterally compressed, keeled in the line of the slit
fissure, and nearly smooth), North Channel, 70, off Lerwick. 18
Atl. 2, 3*a*, 17, 17*a*, 24, 27, 28.

Distribution. From Wellington Channel and Greenland to
southern coast of New England, Iceland, Spitzbergen, and
Mayen I. to Scarborough, Novaia Zemblia, Okhotsk Sea, N. Jap
and Corea, Strait of Magellan (Acton and 'Challenger' Ex
between C. of Good Hope and Kerguelen I. ('Challenger' Ex
4–430 fms.

Fossil. Miocene?: Sicily. Pliocene: Coralline Crag and S. It
Post-tertiary: Scandinavia, Scotland, and Yorkshire, Sicily,
Labrador, mostly in "glacial" deposits; 0–470 ft.

The odontophore has been well figured by Friele, and shows t
it is of a Rhipidoglossan type.

The genus *Cemoria* of Leach MS., as defined by Risso, is certai
not the genus *Puncturella*; his type is doubtfully referred to
Patella equestris of Linné.

3. PUNCTURELLA CLATHRATA[1], Jeffreys. (Plate L. fig. 11.)

SHELL forming an oblong cone, rather solid for its size, opa
and lustreless: *sculpture*, numerous fine longitudinal striæ
stronger concentric ridges, the intercrossing of which produce
cancellated appearance; the striæ do not reach much beyond h
way from the margin, where the ridges become slighter and crow
up to the apex: *colour* pale brownish white: *beak* smooth, incurv
twisted a little to the left, and ending in a spire of a single who
foramen forming a long triangular slit: *mouth* oblong: *margin* fin
scalloped: *inside* smooth and glossy: *septum* large, triangular a
P. profundi. L. 0·15, B. 0·1.

'Porcupine' Exp. 1870: Atl. St. 17*a*. A single and somew
imperfect specimen, but peculiar and characteristic.

[1] Latticed.

Distribution. Off Culebra I. ('Challenger' Exp.); 390 fms.

It differs from the young of *Fissurella græca*, which it resembles in shape, in having not only a different kind of cancellation but especially an internal septum.

1. **FISSURELLA GRÆCA**, Linné.

Patella græca, L. S. N. p. 1262.

F. græca, B. C. iii. p. 266, pl. vi. f. 4; v. p. 200, pl. lix. f. 5.

'Lightning' Exp., St. off the Faroe I.

'Porcupine' Exp. 1870: Atl. St. Vigo B., 24, C. Sagres, Tangier B.; Med. G. Tunis.

Distribution. Shetland (*Forbes*) to the Archipelago and Egypt, Adriatic, Mogador, Madeira, Canaries; 0–95 fms.

Fossil. Miocene: Vienna Basin and Switzerland (*Hörnes*)? Pliocene: English and Belgian Crags, Transylvania, S. France, N. Africa, Italy, Morea, Rhodes. Post-tertiary: England and Ireland, Sicily, Ischia I.; 0–1360 ft.

Varies greatly in the sculpture: in some specimens it is strong, coarse, and sparse; in others fine and close. Very young shells have no foramen or slit, but a prominent spire. I have a monstrosity which grew and lived in the Hamburg aquarium; after commencing in the usual way, it became expanded and was composed of laminæ like those of a common oyster. Linné evidently included several species in his *F. græca*, as is shown by his citations of Lister, Adanson, and Gualteri.

There are several obsolete and questionable synonyms.

2. **FISSURELLA GIBBERULA**, Lamarck.

F. gibberula, Lam. An. s. Vert. vi. (2) p. 15 (1822).

'Porcupine' Exp. 1870: Med. St. Benzert Road, Rasel Amoush.

Distribution. Brittany to the Archipelago and Egypt, Adriatic, Canaries (*McAndrew*), Guinea (*Dunker*), Panama (*P. Carpenter*); 0–120 fms.

Fossil. Pliocene: Italy. Post-tertiary: Sicily; 0–22 ft.

I am by no means satisfied that this so-called species is more than a dwarf variety of *F. græca*. Many intermediate forms occur. The size of the foramen and the degree of gibbosity are unreliable characters.

Perhaps the present species may have been the long-lost or doubtful *Patella pustula* of Linné, which is described as "gibboso-convexa." The word "præcedenti" might have been a mistake for "sequenti," viz. to *P. græca* instead of *P. fissura*, because the other characters belong to *Fissurella* and not to *Emarginula*. However, it is not the *F. pustula* of Lamarck.

F. gibba of Philippi (1836), and a few other synonyms. Gibbus is a classical word, not gibberulus.

3. **FISSURELLA NUBECULA**, Linné.

Patella nubecula, L. S. N. p. 1262; Martini, Conch. Cab. i. t. 12. f. 105.

'Porcupine' Exp. 1870: Atl. St. Vigo B.

Distribution. Cornish coast (*coll. Turton*)?, Bay of Biscay (*Folin*), Cadiz (*Paz*, f. *Hidalgo*), throughout the Mediterranean, M gador, C. Verd I., and Senegambia (*Riebisch*, f. *Weinkauff*), Guin (*Dunker*); 3–100 fms.

Fossil. Pliocene: S. Italy.

Among the synonyms is *F. nimbosa* (afterwards *rosea*) of Philipp but not *Patella nimbosa* of Linné.

1. EMARGINULA FISSURA, Linné.

Patella fissura, L. S. N. p. 1261.

E. fissura, B. C. iii. p. 259, pl. vi. f. 3; v. p. 200, pl. lix. f. 2.

'Lightning' Exp.: St. 4, 5, off the Faroe I.

'Porcupine' Exp. 1869: 2, 6, 14, 18, 23*a*, L. Foyle, N. Channe 68, The Minch, Little Minch, near Belfast (and var. *elata*). 1870 Atl. Vigo B., 24 (var. *elata*); Med. Capo de Gata, Adventure Ban

Distribution. Finmark and Faroe I. to the Canaries, Mediterr nean and Adriatic; 0–295 fms.

Fossil. Miocene?: Sicily (*Seguenza*). Pliocene: Edeghe (*Nyst*)?, Coralline and Red Crag, Antwerp Crag, S. France, Italy Post-tertiary: Norway and Sweden, Scotland and Ireland, Sicily 0–200 ft.

E. conica of Schumacher, and *E. reticulata* of Sowerby.

2. EMARGINULA ROSEA, Bell.

E. rosea, Bell, in Zool. Journ. i. p. 52, pl. 4. f. 1: B. C. iii p. 261; v. p. 200, pl. lix. f. 3, 3*a*.

'Porcupine' Exp. 1870: Med. St. 26.

Distribution. Southern counties of England, Blankenberg, Brittany, N. Spain, Mediterranean and Adriatic (var. *pileolus*); 7–95 fms

Fossil. Pliocene: Coralline Crag, N.W. Germany, Italy, an Rhodes.

It is extremely problematical whether this is *E. rubra* of Lamarck His description of the colour ("rubrâ aut albo rubroque variegatâ" is not applicable; and the habitat ("les mers de l'Europe?") i given with a doubt. He does not even notice any transverse striæ.

The aberrant form or variety (*E. pileolus*, Michaud=*E. capuliformis*, Philippi,=*E. curvirostris*, Deshayes,=*E. costæ*, Tiberi) i connected with the typical form by intermediate and insensibl gradations.

3. EMARGINULA CRASSA, J. Sowerby.

E. crassa, J. Sow. Min. Conch. p. 73, t. 33, upper figures: B. C iii. p. 263; v. p. 200, pl. lix. f. 4.

'Porcupine' Exp. 1869: St 6, 24, 25, 89.

Distribution. Bodö in Norway to the coasts of Anglesea an Dublin, Weymouth B. (*Thompson*, f. *Pleydell*)?; 0–300 fms.

Fossil. Miocene?: Sicily (*Seguenza*). Pliocene: Coralline an Red Crag, Belgium, S. Italy. Post-tertiary: Norway, Sicily 0–100 ft.

E. decussata of Philippi and *E. gigantea* of Seguenza. A variet from the Coralline Crag was named *E. crassalta* by the late Mr

Searles Wood. Mr. Robert Bell showed me a specimen from the Red Crag which measured 2½ inches in length by 1¾ inch in breadth. The odontophore has been figured by Friele.

4. EMARGINULA CANCELLATA, Philippi.

E. cancellata, Phil. En. Moll. Sic. i. p. 114, t. vii. f. 15: B. C. v. p. 200, pl. ci. f. 4.

'Porcupine' Exp. 1870: Med. Adventure Bank (fragment).

Distribution. Guernsey (*Gallienne*) !, G. Gascony (*Fischer*), Mediterranean from Marseilles to the Archipelago and Egypt, and Adriatic, off Madeira ('Travailleur' Exp. 1882); 8–250 fms.

Fossil. Miocene?: Modena (*Foresti*). Pliocene: S. France, Italy, Rhodes. Post-tertiary: Sicily.

I find four obscure and obsolete synonyms.

5. EMARGINULA HUZARDI, Payraudeau.

E. huzardii, Payr. Moll. de Corse, p. 92, t. v. f. 1, 2.

'Porcupine' Exp. 1870: Med. St. 55.

Distribution. Throughout the Mediterranean and Adriatic, Madeira (*Watson*); 8–40 fms.

Fossil. Pliocene: Antibes (*A. Bell*), Calabria (*Seguenza*).

E. depressa of Risso, whose publication bears the same date as that of Payraudeau; but the specific name given by the latter is generally accepted and used. A large variety is the *E. cusmichiana* of Brusina and *E. fissurelloides* of Nardo.

6. EMARGINULA PAPILLOSA, Risso.

E. papillosa, Risso, Hist. Nat. de l'Eur. mér. (1826), t. iv. p. 260, pl. x. f. 147.

'Porcupine' Exp. 1870: Alt. St. 24, 25, 27, 28; Med. Capo de Gata.

Distribution. Mediterranean and Adriatic; 10–40 fms.

Fossil. Pliocene: Nice (*Risso*), Messina (*Seguenza*).

E. adriatica of O. G. Costa, 1829.

7. EMARGINULA COMPRESSA, Cantraine.

E. compressa, Cantr. Diagn. esp. nouv. Moll. (Bull. de l'Acad. roy. Brux. ix. 2, 1835), p. 22.

E. tuberculosa, Libassi, Mem. Conch. foss. Palermo (Atti, iii. 1859), p. 15, fig. 1.

'Porcupine' Exp. 1870: Atl. St. 24, 27, 28, 28*a*.

Distribution. None recorded in a recent or living state.

Fossil. Miocene?: Sicily (*Seguenza*). Pliocene: Sicily.

This appears to be Libassi's species, and agrees with his short description and his figure. I lately received from my kind and learned friend, the Abbé Brugnone of Palermo, a fossil shell named *E. tuberculosa*, which had the same shape as the recent shell, and in which the sculpture on the upper part was likewise wavy, although the cancellation was rather more nodulous in consequence of the specimen not being in good preservation. It differs from *E. papillosa* in being more compressed at the sides, and is shorter or has a rounded and more globular outline; it is readily distinguishable from *E. elongata* by the shape and much finer sculpture.

8. **Emarginula multistriata**, Jeffreys. (Plat

E. multistriata, Jeffr. in Ann. & Mag. N. H. Ju

'Porcupine' Exp. 1870: Atl. St. 24–28.

Distribution. Mediterranean (Italian Expedition,

Family IV. Calyptræidæ.

Calyptræa chinensis, Linné.

Patella chinensis, L. S. N. p. 1257.

C. chinensis, B. C. iii. p. 273, pl. vi. f. 6; v. f. 1, 1*a*.

'Porcupine' Exp. 1870: Atl. St. Vigo B., 16, S Sagres, Tangier B., Gibraltar B.; Med. Algesiras B Benzert Road, Rasel Amoush, Adventure Bank.

Distribution. Dublin Bay, Milford Haven, sou England and Channel Isles, Brittany, S.W. France, Mediterranean and Adriatic, Black Sea (*Clessin*), off Morocco ('Travailleur' Exp. 1881), Madeira 0–130 fms., usually inhabiting shallow water. The given on the authority of Laskey and Leach, are cert

Fossil. Miocene?: Modena (*Foresti*). Pliocene: and Norwich Crags, Belgium, S. France, Italy, Switzerland, Vienna Basin, Transylvania, Hungar Cos. Post-tertiary: Leghorn (*Castelli*, f. *Appelius*

There are about a dozen more or less recogn including *C. sinensis*. The monstrous variety whic *Turritella terebra* is very curious.

Crepidula unguiformis, Lamarck.

C. unguiformis, Lam. An. s. Vert. vi. (2) p. 25; *Crepidula*, f. 6.

'Porcupine' Exp. 1870: Med. St. Adventure Ba

Distribution. G. Gascony (*De Folin*)!, Morocco, and Adriatic, G. St. Lawrence and eastern coasts 0–40 fms.

Fossil. Miocene: Vienna Basin, Switzerland, S.W cene: Belgium, S. France, Italy, Algeria. Post-ter (*Philippi*).

This species also rejoices in, or rather laments, synonyms. It is the *Patella crepidula* of Linné, some authors (but, perhaps, not *P. fornicata* of Linn of Say. When the so-called *C. fornicata* is found outside and *C. plana* to the inside of the same speci American shell, they may easily be mistaken for *C. moulinsi* of Michaud is a well marked variety, it racter being dependent on coloration. The youn spire like that of *Calyptræa chinensis*. *Crepidula s* is also the present species, and derives its peculiar minent spire from being affixed to *Turritella terebra*, *chinensis*.

SUMMARY OF THE FOREGOING LIST.

Class SOLENOCONCHIA.

Families.	Genera.	No. of species.
DENTALIIDÆ	DENTALIUM	12
	SIPHODENTALIUM	5
	DISCHIDES	1
	CADULUS	9

Class GASTROPODA.

Families.	Genera.	No. of species.
CHITONIDÆ	CHITON	10
PATELLIDÆ	PATELLA	1
	HELCION	1
	TECTURA	6
	ADDISONIA	1
	PROPILIDIUM	4
FISSURELLIDÆ	FISSURISEPTA	3
	PUNCTURELLA	3
	FISSURELLA	3
	EMARGINULA	8
CALYPTRÆIDÆ	CALYPTRÆA	1
	CREPIDULA	1
	Total	69

In order to make this work as complete as possible up to the present time, I will add a few notes, chiefly with regard to distribution, which have occurred to me since the publication of the last Supplement. These addenda and corrigenda seem to be endless; but in the continual progress of science they are unavoidable.

Through the obliging courtesy of Professor Verrill I have now been enabled to examine examples of many of the species procured during his long and careful exploration of the sea-bed adjoining the coasts of New England at considerable depths, which have been lately described or noticed by him in the 'Transactions of the Connecticut Academy.' The result of my comparison of these species with European species from deep water is most interesting and important. Out of 35 species which Professor Verrill has thus kindly sent me, I consider 29 or 30 identical with European species. It shows the far more extensive range of marine Mollusca at certain depths than of land and freshwater Mollusca over any territorial area of equal space.

SUPPLEMENT TO PARTS I., II., III., IV.

Part I., P. Z. S. 1878:—

Page 399. *Terebratula caput-serpentis*. *Fossil*. Miocene: Marne Vaticano (*Ponzi*).

„ 402. *Terebratula tuberata*. Bay of Biscay ('Travailleur' Exp., 1881); 1093 fms.

P. 563. *Lima subovata.* Between Lisbon and Canaries ('Travailleur' Exp. 1882); 1192 fms.

P. 564. *Lima subauriculata.* Between the Hebrides and Faroes ('Triton' cruize); 570 fms. Josephine Bank; 110–120 fms.

„ *Lima excavata.* *Fossil.* Pliocene: Calabria (*Seguenza*)!

P. 566. *Mytilus incurvatus.* Probably a Pliocene fossil of the Bolognese, as *Modiola rectemarginata* of Foresti.

P. 567. *Mytilus phaseolinus.* Black Sea (*Spratt*); 45–50 fms.

P. 569. *Dacrydium vitreum.* Between the Hebrides and Faroes ('Triton' cruise); 570 fms. Azores ('Josephine Exp.); 200–300 fms.

P. 570. *Idas argenteus.* Between the Hebrides and Faroes ('Triton' cruise); 516 fms. Inhabiting deserted tubes of *Teredo megotara* in a large water-logged piece of pine-wood, to which the *Idas* had fixed itself by a strong byssus. It is covered with a pale brownish-yellow epidermis, which rises into fibrous excrescences on the posterior side. Under the epidermis the shell is silvery white. An internal and long cartilage covers the hinge. I was mistaken as to this when I described the species from two small valves. The beak has a reddish colour like that of *Cypricardia lithophagella.* The shape varies from rhomboidal to oblong. Size of my largest specimens 3½ tenths of an inch or about 8 millimetres. With it in a "commensal" way lived an undescribed species of *Cocculina,* or a new genus of the same family, to which I propose giving the name of *spinigera*; this would seem to have fed on decomposed portions of the *Teredo.* Small Annelids also occupy the tubes and probably have the same habit. The little limpet is coated with a ceratose sponge, which gives it a prickly appearance. The smaller and younger specimens of *Teredo* were living when the piece of wood came up in the trawl. *Idas argenteus* is probably the species of that name noticed by Verrill as var. *lamellosa,* from 337 fathoms off the coast of New England.

„ *Arca barbata.* C. Verd I. (*de Rochebrune*).

„ *Arca nodulosa.* *Fossil.* Miocene: Marne Vaticano (*Ponzi*).

P. 571. *Arca tetragoaa.* C. Verd I. (*de Rochebrune*).

„ *Arca antiquata.* C. Verd I. (*de Rochebrune*).

P. 572. *Arca obliqua.* Josephine Bank, 340–430 fms.

„ *Arca glacialis.* G. Mexico (*Dall*)?

„ *Arca pectunculoïdes,* var. *septentrionalis.* New England (*Verrill*); 310 fms.! Between the Hebrides and Faroes ('Triton' cruise); 570 and 608 fms. Mediterranean (Italian Exp., 1881); 337–464 fms.

P. 575. *Leda fragilis*. New England (*Verrill*, as *L. unca*, Gould); 115 fms. Sea of Marmara (*Spratt*); 20 fms.

P. 576. *Leda frigida*. Between the Hebrides and Faroes ('Triton' cruise); 640 fms.

P. 577. *Leda tenuis*. Between the Hebrides and Faroes ('Triton' cruise); 640 fms.

P. 578. *Leda striolata*. Mediterranean ('Travailleur' Exp., 1881); 221 and 913 fms. Between Gibraltar and Azores ('Josephine' Exp.); 550 fms.

„ *Leda lucida*. Between the Hebrides and Faroes ('Triton' cruise); 516 and 570 fms.

„ *Leda pusio*. Mediterranean ('Travailleur' Exp., 1881); 653 fms.

P. 579. *Leda jeffreysi*. Dele Palermo as a locality.

„ *Leda subæquilatera*. Between the Hebrides and Faroes ('Triton' cruise); 640 fms.

P. 580. *Leda expansa*. Between Gibraltar and Azores ('Josephine' Exp.); 790 fms.

P. 581. *Nucula ægeensis*. Mediterranean (Italian Exp., 1881); 1521–1536 fms. *Fossil*. Miocene: Marne Vaticano (*Ponzi*). *N. decipiens* of Philippi. Both names bear the same date; but the description given by Philippi is much more full and precise than that of Forbes; and perhaps *decipiens* ought to be preferred.

P. 582. *Nucula corbuloïdes*. Between the Hebrides and Faroes ('Triton' cruise); 516 and 570 fms. Mediterranean (Italian Exp., 1881); 1521–1536 fms.

„ *Nucula tumidula*. Between the Hebrides and Faroes ('Triton' cruise); 516 and 570 fms.

P. 584. *Pectunculus nummarius*. *Fossil*. Pliocene: C. Verd I. (*de Rochebrune*).

P. 585. *Limopsis cristata*. Between the Hebrides and Faroes ('Triton' cruise); 516 and 570 fms. Bay of Biscay ('Travailleur' Exp., 1881 and 1882); 341–1693 fms. Never half the size of *L. minuta*, and different in shape, sculpture, dentition, and crenation of the inner margin.

P. 586. *Malletia obtusa*. Mediterranean (Italian Exp., 1881); 337–464 fms.

„ *Malletia cuneata*. Mediterranean (Italian Exp., 1881); 337–1536 fms.

Part III., P. Z. S. June 1881:—

P. 695. *Lepton lacerum*. N. Spain ('Travailleur' Exp. 1882); 282 fms. *Fossil*. Pliocene: Sicily (*Brugnone*).

P. 696. *Montacuta ferruginosa*. New England (*Verrill*); low water.

P. 698. *Montacuta bidentata*. New England (*Verrill*); shore to 7 fms.

P. 698. *Montacuta ovata*. New England (*Verrill*)?; 100-153 fms.

P. 699. *Lasæa pumila*. Adriatic (*Brusina*).

P. 700. *Loripes lacteus*. New England (*Verrill*, as *L. lens*); 100 fms.

P. 701. *Lucina borealis*. C. Verd I. (*de Rochebrune*).

P. 702. *Axinus orbiculatus*. Coast of Morocco ('Travailleur' Exp., 1881); 174–394 fms. N. Spain (1882); 282 fms. Between Gibraltar and Azores ('Josephine' Exp.); 550 fms.

The specific name *granulosus*, which was originally proposed by me, must be substituted for *orbiculatus*, The Marquis de Monterosato has lately pointed out, in the second part of his 'Conchiglie del Mediterraneo,' that he described the principal characters of this species in the 'Journal de Conchyliologie' for 1874, page 251, two years before the publication by Professor Seguenza.

P. 703. *Axinus incrassatus*. *Fossil*. Pliocene: Monte Mario (*Rigacci*)!

P. 704. *Axinus subovatus*. New England (*Verrill*) ?; 500 fms.

P. 706. *Cardium echinatum*. *Fossil*. Ranges in height to 1360 feet.

P. 707. *Cardium tuberculatum*. *Fossil*. Pliocene: Belgium.

P. 708. *Cardium fasciatum*. Black Sea (*Spratt*); 45 fms.

P. 709. *Cardium norvegicum*. *Fossil*. Pliocene: Belgium.

P. 711. *Astarte sulcata*, typical form. Off Canaries ('Travailleur' Exp. 1882); 325 fms.

,, *Astarte crenata*. *Fossil*. Pliocene: Belgium.

P. 713. *Astarte pusilla*. *Fossil*. Pliocene: Reggio, Calabria.

P. 714. *Venus effossa*. Adriatic (*Brusina*).

P. 715. *Venus casina*. *Fossil*. Pliocene: Belgium.

,, *Venus multilamella*. *Fossil*. Miocene: Marne Vaticano (*Ponzi*).

P. 717. *Tapes virgineus*. *Fossil*. Pliocene: Belgium.

P. 718. *Lucinopsis undata*. *Fossil*. Pliocene: Belgium.

P. 719. *Tellina balthica*. C. Verd I. (*de Rochebrune*)?

P. 720. *Tellina compressa*. *Fossil*. Pliocene: Belgium, Bologna.

P. 721. *Tellina distorta*. *Fossil*. Pliocene: Sicily.

P. 723. *Donax venustus*. C. Verd I. (*de Rochebrune*).

Part IV., P. Z. S. November 1881:—

P. 923. *Mactra solida*. *Fossil*. Height ranges to 1360 feet.

P. 924. *Lutraria rugosa*. C. Verd I., and *fossil* (*de Rochebrune*).

P. 925. *Lutraria oblonga*. *Fossil*. C. Verd I. (*de Rochebrune*).

,, *Scrobicularia nitida*. G. Marseilles ('Travailleur' Exp., 1881); 301 fms. Between Gibraltar and Azores ('Josephine' Exp.); 550 fms.

P. 926. *Scrobicularia longicallus*. G. Marseilles ('Travailleur'

Exp., 1881); 292½–364 fms. *Fossil.* Mio
Marne Vaticano (*Ponzi*).

P. 926. *Scrobicularia alba.* Black Sea (*Spratt*); 45 fms.
Miocene: Marne Vaticano (*Ponzi*).

P. 927. *Scrobicularia prismatica.* Sea of Marmara (*Sp*
20 fms.

P. 930. *Lyonsia formosa.* G. Marseilles ('Travailleur
1093 fms. Azores ('Josephine' Exp.); 200–30

P. 931. *Pecchiolia abyssicola.* Barentz Sea (Dutch Arctic
210 fms. *Cardium fragile* of Noman !

P. 932. *Pecchiolia insculpta.* N. Spain ('Travailleur'
1882); 249 fms.

„ *Pecchiolia subquadrata.* Bay of Biscay ('Trava
Exp., 1881); 1093 fms.

P. 933. *Pecchiolia granulata.* Western Mediterranean (
Exp., 1881); of large size. N. Spain ('Trava
Exp. 1882). *Fossil.* Pliocene: Monte Mari
gacci)!

„ *Pecchiolia acuticostata.* N. Spain ('Travailleur'
1882), of large size; 731 fms. *Fossil.* Pli
Bologna; also large.

P. 934. *Pholadomya loveni.* W. Mediterranean (Italian
1881); 85–1217 fms. Perfect specimens wer
at the last mentioned depth, measuring upw
an inch in length. G. Marseilles ('Travailleur
1881); 301 fms. *Fossil.* Pliocene: Fi
(*Brugnone*)!

P. 936. *Poromya granulata.* Sea of Marmara (*Spratt*);
Coast of Morocco ('Travailleur' Exp. 1881).

„ *Poromya neæroïdes.* N. Spain ('Travailleur' Exp.
perfect; 731 fms.

P. 937. *Neæra subtorta.* Between the Hebrides and
('Triton' cruise); 640 fms.

„ *Neæra obesa.* W. Mediterranean (Italian Exp.,
337–1536 fms. N. Spain ('Travailleur' Exp.
238 fms. Var. *glacialis*, New England (*Ve*
302–365 fms.

P. 938. *Neæra cuspidata*, var. *crassa.* Shetland and Mediter

P. 940. *Neæra depressa.* Bay of Biscay ('Travailleur'
1881); 1093 fms. G. Marseilles (same
301 fms.

P. 941. *Neæra contracta*, Azores ('Josephine' Exp.);
300 fms.

„ *Neæra semistrigosa.* *Fossil.* Pliocene: Reggi
guenza, as *N. lamellosa*); fragment only.

P. 942. *Neæra circinata.* N. Spain ('Travailleur' Exp.
perfect; 1025 fms.

„ *Neæra ruginosa.* Azores ('Josephine' Exp.); 2
fms. A right valve, but imperfect, having
triangular lateral tooth on each side.

P. 943. Dr. E. v. Martens having pointed out that TROPIDOPHORA has been preoccupied in *Cyclostomatidæ*, substitute GONIOPHORA, angulated; although for a sectional name it is immaterial.

„ *Neæra curta.* G. Mexico ('Blake' Exp.); 84–152 fms. Professor Verrill, in his lately published Catalogue of some New-England marine Mollusca (Trans. Conn. Ac. July 1882, v. p. 560), considers this a variety of his *N. multicostata*, which is my *N. striata*. I may, however, remark that *N. curta* was sufficiently described by me in the 'Annals and Magazine of Natural History' for December 1876, and that the learned Professor was not quite correct in designating that species as named merely but not described.

P. 944. *Neæra costellata.* W. Mediterranean (Italian Exp., 1881); 817 fms.

„ *Neæra striata.* Between the Hebrides and Faroes ('Triton' cruise); 570 fms. Between Gibraltar and Azores (*Josephine* Exp.); 200–700 fms. *N. multicostata*, Verrill and Smith.

P. 945. *Mya truncata. Fossil.* Pliocene: Belgium.

P. 947. *Xylophaga dorsalis.* Mediterranean ('Travailleur' Exp., 1881); 301–913 fms.

EXPLANATION OF THE PLATES.

PLATE XLIX.

Fig. 1. *Dentalium capillosum*, p. 658.
2. —— *candidum*, p. 658.
3. —— *subterfissum*, p. 660.
4. —— *ensiculus*, p. 660.
5. *Siphodentalium teres*, p. 661.
Fig. 6. *Cadulus cylindratus*, 664.
7. —— *gracilis*, p. 664.
8. —— *tumidosus*, p. 665.
9. —— *amphora*, p. 665.
10. —— *gibbus*, p. 666.

PLATE L.

Fig. 1. *Chiton rarinota*, p. 668.
2. *Tectura rugosa*, p. 671.
3. —— *pusilla*, p. 672.
4. —— *adunca*, p. 672.
5. —— *galeola*, p. 672.
6. *Propilidium scabrosum*, p. 674.
Fig. 7. *Propilidium pertenue*, p. 674.
8. —— *compressum*, p. 674.
9. *Fissurisepta granulosa*, p. 675.
10. *Puncturella profundi*, p. 675.
11. —— *clathrata*, p. 676.
12. *Emarginula multistriata*, p. 680.

November 28, 1882.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

Mr. W. B. Tegetmeier, F.Z.S., exhibited a skull of *Rhinoceros sumatrensis* and some horns of a Buffalo and a Deer from Elopura, Borneo, forwarded by Mr. W. B. Pryer, C.M.Z.S.

Mr. J. E. Harting, F.Z.S., exhibited a specimen of African Eagle-Owl (*Bubo maculosus*) stated to have been 1851 near Waterford, in Ireland, from the collection of Dr. of Waterford.

Mr. R. Bowdler Sharpe exhibited some specimens of Swif him by Dr. Lucan from the Congo.

These consisted of a pair of a species of *Chætura*, evid same as *C. cassini*, Sclater, from Gaboon, with which M had compared them. The range of this species was thus from the Gaboon to the Congo district.

The true *Chætura sabinii* was discovered in Sierra Leo E. Sabine, and was afterwards met with in Fernando P Fraser (cf. Strickl. P. Z. S. 1844, p. 99), and had been more found on the Loango coast by Dr. Falkenstein (cf. Reichen 1877, p. 21).

Chætura ussheri, Sharpe, still remained known only original specimens, procured by the late Governor Ussher on Coast (Fort Victoria).

Dr. Lucan had also forwarded a pair of *Cypselus*, with and eggs, which he believed to belong to *Cypselus sharpii* (Bull. Soc. Zool. France, i. p. 228, pl. vi. fig. 1). The s however, showed that the Congo bird now procured by was the true *C. caffer*, identical with South-African speci

C. sharpii differed from *C. caffer* in having a less forked especially in having the rump-band perfectly uniform, with the narrow black shaft-lines which were seen in *C. caffer*; on the throat also descended further.

Mr. Sharpe also exhibited a specimen of *Machirhamph* obtained by Mr. Everett near Papar in Northern Borneo, remarks on the geographical distribution of this singula Accipitres.

A communication was read from Dr. A. B. Meyer, C. reference to Mr. Harting's communication (above, page the desirability of adopting a standard of nomenclature for th tion of the colours of natural objects. Dr. Meyer called to Radde's international colour-scale published some yea Hamburg, which appeared to him to answer the require exactly. Dr. Meyer had made use of this work for his fo monograph on the Jadeite and Nephrite objects of th Museum, and had recommended it to several scientifi especially to travellers who wished to determine the colo human skin in different races, Broca's scale being insuffici purpose. Dr. Meyer was of opinion that the use of thi work would be far preferable to the republication of Werner clature as proposed by Mr. Harting.

The following papers were read :—

1. On the Sternum of *Notornis* and on Sternal Characters. By Professor Owen, C.B., F.R.S., F.Z.S., &c.

[Received November 10, 1882.]

In the 'Proceedings' of this Society for 1882, referring to the meeting held January 7th, it is stated that "Professor Newton exhibited the skin and bones of the trunk of a specimen of *Notornis mantelli*, obtained in the province of Otago eighteen months before." On these specimens the sole remark recorded is, "that the sternum figured in the Society's 'Transactions,' vol. iv. pl. 4. figs. 5–8, as of this species must belong to a totally different form" (loc. cit. p. 97).

As a means of judging of the degree and kind of difference, it may not be unacceptable to ornithologists to compare the subjoined figures (pp. 690, 691) of the sternum of *Notornis mantelli*, of the natural size, with those of the sternum in the plate above cited, the original of which may be seen in the Geological Department of the Museum of Natural History, Cromwell Road.

Prior to the date of Prof. Newton's communication I had received from Prof. T. Jeffery Parker, University of Otago, New Zealand, a notice of the arrival there of the skin and following parts of the skeleton of a *Notornis mantelli*, viz. the bones of the trunk with some lower cervical and anterior caudal vertebræ, the scapular arch with sternum, and both femora articulated with the pelvis. As it was Prof. Parker's expressed intention to submit a description of these unique specimens to the Otago Institute, and as he was so good as to send me an impression of the plate, giving reduced views, front and side, of the sternum with other bones of the trunk, I reserved any remark thereon until the reception of the Professor's full and instructive 'Memoir,' which has appeared in the 14th volume of the 'Transactions of the New-Zealand Institute,' 8vo, p. 255 (1882).

Not until the year 1870 had I the opportunity of describing the sternum of *Aptornis*, the extinct Ralline genus surpassing in size *Notornis*. I then remarked:—"The inferiority of size of the sternum figured (plate 4. figs. 5–8[1]) to the sternum of *Aptornis defossor* is greater than that of the femur of *Aptornis otidiformis* as compared with that of *Aptornis defossor*." This might have favoured the conclusion arrived at, or inclined to, in 1850, and indicated in the title to my former paper, in vol. iv. p. 1, of our 'Transactions.' But further insight was to be had by comparison of the subject of plate 4. figs. 5–8 with the parts of the skeleton of *Aptornis otidiformis* subsequently acquired.

Such comparison suggested, in 1870, the following remarks:—"The relative size of the smaller sternum to the femur of *Aptornis otidiformis* is more like the relative size of the sternum of *Aptornis defossor* to the femur of that species, than is the relative size of the 'smaller sternum' to the femur of *Notornis*. Seeing, therefore, in

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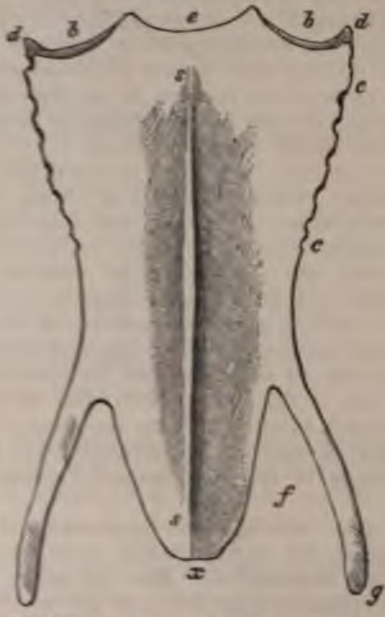
[1] Trans. Zool. Soc. vol. iv. pp. 1–18, Febr. 1850.

the Rallines here compared, that as the wings decrease an
increase in size the sternum becomes shorter in proporti
femur, I am inclined to believe that the smaller sternu
figs. 5–8) has belonged to *Aptornis otidiformis* rather
Notornis. This view derives further support from the
with the decreasing relative size to the femur, there is a p
simplification of the sternum in the recent Rallines (*Tribo
dromus*), by which the still more simple type of the bone in
defossor is approached"[1].

A ground for excuse in reproducing this passage is the not

Fig. 1.



Sternum of *Notornis mantelli*, under surface; nat. size.

cited in the Society's 'Proceedings' in relation to the s
Prof. Parker's memoir.

In this there is no concurrence with the accomplished C
Professor as to "the total difference of form of the st
Notornis from that of *Aptornis*;" and the divergence is
"zoological" as regards the "form," "family," or "genus
which *Notornis* most resembles, but is "critical" in relati
earlier author and his contributions on the subject.

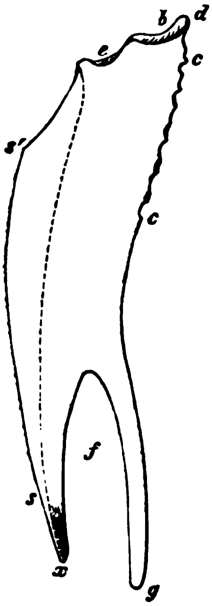
As to the history, Professor Parker writes:—"The genus

Trans. Zool. Soc. vol. viii. 1871, p. 120.

was founded by Prof. Owen in the year 1848; the skull was fully described in the 'Transactions of the Zoological Society,' and the genus referred to the family *Rallidæ* as a close ally of *Porphyrio*. Shortly after he received a femur, a tibia, and a tarso-metatarse of the same bird, as well as a sternum which he, at first, erroneously referred to *Notornis*, but afterwards (in 1871) recognized as belonging to *Aptornis otidiformis*"[1].

Far from the genus *Notornis* belonging "to a totally different form," the acquisition of additional osteological data confirms its reference, together with the extinct *Aptornis*, to the Ralline family.

Fig. 2.



Sternum of *Notornis mantelli*, side view; nat. size.

Prof. Parker selects the New-Zealand genera *Tribonyx*, *Porphyrio*, and *Ocydromus* for his illustrations of this affinity of *Notornis*; and in regard to the sternum, finds the closest resemblance to it in that of *Tribonyx*: in this "it is of the same proportional length to breadth;" it is shorter relatively than in *Porphyrio*, but is considerably longer than in *Ocydromus*; but its breadth, in proportion to the length of the trunk, is greater than in any of the three smaller Rallines.

As in *Tribonyx* and the flightless "Wood-hens," the manubrial margin of the sternum of *Notornis* (fig. 1, p. 690, *e*) does not develop

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[1] 'Transactions of the New-Zealand Institute,' vol. xiv. 1882, p. 245.

the Rallines here compared, that as the wi
increase in size the sternum becomes sho
femur, I am inclined to believe that the
figs. 5–8) has belonged to *Aptornis oti*
Notornis. This view derives further sup
with the decreasing relative size to the fem
simplification of the sternum in the recent
dromus), by which the still more simple typ
defossor is approached"[1].

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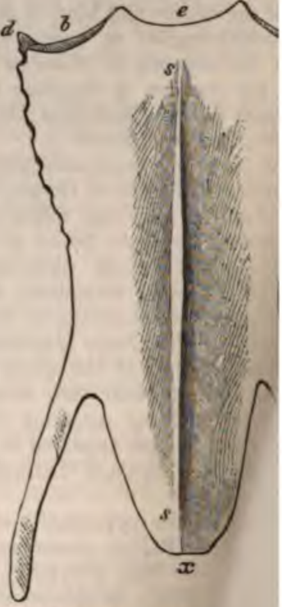

Sternum of *Notornis mantelli*,

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Professor as to "the total differ
Notornis from that of *Aptornis*;
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As to the history, Professor Pa

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[1] Trans. Zool. So

likewise included in the subclass "*Ratitæ*" of a binary ornithological system?

On a conjectural ancestral relation of the keelless external character to the present advanced volant faculty of the Avian class, the Dodo had made some progress thereto from its assumed "ratite" progenitor: it had risen to the rudiment of a keel.

To this conclusion, however, another conjecture opposes itself. Dodos (*Dididæ*), having gained in bulk and weight upon other geographically associated birds of their own family or genus, and finding sufficient sustenance on the ground, with convenience for nidification, had no call to exert the strenuous act of flight. The stimulus thereto, which we daily witness in birds about us, was wanting. There were no enemies, quadrupedal or bipedal, in the tract of land now reduced to the islands of Mauritius and Rodriguez, to disturb their wellbeing and threaten their existence.

I have elsewhere remarked, as bearing upon the interesting question of the relation of the simplified sternum to the genesis of Birds, that *Pezophaps*, the largest land-bird seen by the early settlers in the island of Rodriguez, "differed in no other respect from the class-rule in other birds, save in the inability to fly by the action of the fore limbs. There were no enemies, native to the island, able to take advantage of that disablement—'Il ne s'y trouve aucun animal à quatre pieds, que des rats, des lezards, et des tortues de terre,' writes Leguat in his interesting little book[1]. The 'Solitaires' had no call to practise or to endeavour to practise that hardest mode of locomotion to obtain sustenance or fulfil any of the conditions of preservation of the individual or of the species; they were never scared into the violent volant exercise"[2]. The exiled Huguenots derived the best, if not largest, proportion of their animal food from the wingless birds of Rodriguez.

The advent of Man, with or without a subservient carnivorous quadruped, is an intelligible cause of the extinction of species, especially of birds attracting his hunger by their size and unable to escape by flight. Thus the huge wingless *Dromornis*[3], like *Diprotodon*, has become known to us only by the osseous remains in Australia. The smaller Emu and Cassowary are there restricted in range and numbers, and seem to be gradually passing away.

The fact of a range of variety in size has been determined in the individuals of many species. Such variety affecting a *Cereopsis* Goose to the degree shown by *Cnemiornis*[4] would, in a corresponding degree, render the act of flight more difficult and laborious. Consequently, if that act were not needed for the acquisition of food, it might seldom or never be exercised in the absence of any enemy from which it would offer a way of escape. By long disuse of the wings, continued through successive generations, those organs, agreeably with Lamarck's theory of the 'Origin of Species,' would become enfeebled, and ultimately atrophied to the degree exemplified in *Apteryx* and *Dinornis*. The legs, then monopolizing the functions of locomotion, would attain, through the concomitant force and frequency of exercise, proportional increase of power and size. Under these conditions may be comprehended, by *veræ causæ*, the origin of the great flightless Anserine which is entered as a "species" in Ornithological Catalogues under the name of *Cnemiornis calcitrans*. It has become such through no choice or selection, but by a combination of circumstances enforced, with operative conditions of organic vitality, first taught us by the immortal author of the 'Philosophie Zoologique.'

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[1] Voyage et Avantures de François Leguat, &c. 12mo, à Londres, 1708.

[2] Memoirs on the Extinct Birds of New Zealand, and on those of Mauritius, Australia, &c. 4to, 1878. Appendix III. p. 5.

[3] *Ib.* Appendix I. p. I.

[4] Trans. Zool. Soc. vol. v. 1865, p. 395.

The same course of cogitation, so guided, leads to the same conclusion as to the origin of *Notornis*, of *Aptornis*, of *Dinornis*. The tendency to variation in size and proportions, after the reduction and loss of wings, leads to the minor modifications of such flightless genera.

The genus *Notornis* is now known to be represented by species, living in the present generation of New-Zealand colonists, in localities nearly one hundred miles apart, and which have belonged to a once gregarious family.

The first captured specimen of the species, *N. mantelli*, was taken by seal-fishers (1847) near the coast of "Duck Cove," Resolution Island, Dusky Sound; the second specimen was caught (1869) at "Deas Cove," Secretary Island, Thompson's Sound; the third specimen, which afforded the subject of Prof. Jeffery Parker's memoir[1], was caught (1881) by a rabbit-hunter in Captain Hankinson's "Run," on "Bare-patch Plains," east of "Te anau" Lake,—all in the South Island of New Zealand.

In 'Phillip's Voyage to Botany Bay' a large ralline bird was noticed on what is now "Norfolk Island," under the name of *Fulica alba* (1789, p. 160). A good coloured plate of the same species is given in Surgeon White's 'Voyage to New South Wales,' 4to, 1790, with a brief notice at p. 238, under the name of "*Gallinula alba*" (the "plates" are not numbered in this work). In size and shape of head and beak, in the reduced proportions of the wings, in the strength of the legs and feet, in the carpal spur, and the colour of the beak, this bird seems but a variety of *Notornis mantelli*; it is at least a species of the same genus, as von Pelzeln has pointed out in 'The Ibis' of 1873, p. 44[2].

But no "Redbill" or "Takahe" has since rewarded a naturalist's quest in "Lord Howe's" or "Norfolk Island." A species of the New-Zealand genus *Ocydromus* (*O. sylvestris*, Sclater) still exists there, and is said to be easily captured.

The Wood-hens flourish in both South and North Islands of New Zealand, as in the smaller tract nearer the Antarctic latitudes; but they are severally represented by modifications noted as *Ocydromus earli*, *O. australis*, and *O. sylvestris*.

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[1] *Loc. cit.* p. 245.

[2] A copy of White's figure is given in 'The Ibis,' 1873, pl. x.

Notornis is extinct in the North Island, but it still lingers, as we have seen, in the South Island of New Zealand. A perfect skeleton of the Norfolk-Island "Redbill" might show modifications, with claims to specific distinction from *N. mantelli*, like those which have been founded on the osseous remains of the extinct Moas of both North and South Islands of New Zealand. Hitherto I have not received remains of the genus *Dinornis* from any of the outlying tracts of land which may be conceived to have once formed, with the two New-Zealand islands, parts of a southern continent. *Apteryx*, like *Ocydromus*, is still represented by existing species in both North and South Islands. Considering the restricted powers of locomotion of the several genera above cited, it may be inferred that the lands yielding examples of such flightless birds were not, in their primitive days, separated by such breadths of ocean as that which divides the South Island from Lord Howe's Island, or as that known as "Cook's Straits." We may conceive the lapse of time since the geological forces occasioned such divisions of a southern continent to have been so considerable as to have allowed the conditions originating technical species to have led to the modifications which distinguish the Northern from the Southern Moas, Kivis, and Wekas, and the Southern *Notornis* from that which inhabited the land of Norfolk Island. Lamarck's hypothesis of the way of work of the secondary evolutional cause of Species, by the influence, viz., of circumstances exciting or checking the exercise of parts, is more intelligible, more applicable in connexion wih observed facts, to the before-cited ornithic cases than is Darwin's or Wallace's 'Natural Selection.'

Passing from the origin to the extinction of species, I may remark that the accomplished naturalist and ornithologist Professor Emile Blanchard, referring to the abundance of remains of *Dinornis* in the South Island of New Zealand, writes:—"Aussi est-il difficile de croire que la destruction totale de ces remarquables créatures ait été accomplie par les Maories toujours clairsemés sur le littoral de l'Ile du Sud. Selon certaine probabilité, les événements physiques ont été la cause première de cette destruction;" and he infers that "L'extinction de ces oiseaux gigantesques serait une nouvelle preuve de l'effondrement du continent austral"[1].

But it is not easy to conceive that birds commanding, like the Moas, great powers of traversing dry land, would permit themselves to be submerged, for example, with the sinking proportion of their continent which has separated the North from the South Island of New Zealand. The Maories may have decreased in numbers in the portion so severed which was less favoured by climate and fertility. But this would be likely to quicken their quest and improve their ways of capture and slaughter of their great feathered flightless game. The discovery in the grave of the ancient chief, interred at "Kai Koras" in the South Island, of the egg of *Dinornis ingens* on his lap[2], placed there, probably, for sustenance during his journey to the "next world," testifies, with the scorched bones and fragments

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[1] C. R. Acad. Sc. 1882, p. 392.

[2] Memoirs on the Great Wingless Birds of New Zealand &c. p. 318, pl. cxvii.

The determination and the scientific analysis of the birds which we receive from the Moluccas is greatly facilitated for us by the excellent and very comprehensive work of Tommaso Salvadori, "Ornitologia della Papuasia e delle Molucche," Parte I. Accipitres, Psittaci, Picariæ (in the 'Memorie della Reale Accademia delle Scienze di Torino,' serie ii. tomo xxxiii.: Torino, Ermanno Loescher, 1881, 4to), and Parte II. Passeres (Torino, Stamperia Reale: G. B. Paravia e Co., 1881, 4to). This work, as well as the numerous publications of the same author in the 'Annali del Museo Civico di Genova,' and especially also the 'Prodromus Ornithologiæ Papuasiæ et Moluccarum,' published in the different series of those Annals, have been of the utmost use to me in the present treatise.

The collection of Dr. Platen is not very large; but among the forty-nine birds, which comprise twenty-one different species, we find nevertheless one species which is absolutely new to the fauna of Ceram, and several others which give occasion for further observations and the discussion of other systematic questions. The remarks of the collector (given with inverted commas) on the colour of the iris and the naked parts of the skins, the total length in fresh condition (L.), and the distance between the ends of the wings and tail (D.), &c., as well as the precise information as to the locality and the time of collecting, will be found most valuable, as they have likewise been of great advantage to my former notes on Dr. Platen's collections from Borneo and other localities.

I shall now give the list of the birds which Dr. Platen has lately sent; and (with the exception of the four last species, which have not yet been treated by Salvadori) I shall follow the order of the above-named work of Salvadori, adding the number of the page for each separate species.

1. **Cuncuma leucogaster** (Gm.), Salvad. i. p. 7.

"*Male.* Iris grey-brown. L. 72 cm., D. 3·5 cm. Bill horny grey-blue; cere and feet light grey-blue. Lokki, Ceram, 28 November 1881."

The specimen is young, and has nearly the coloration of the feathers which Salvadori describes as belonging to the young bird; only the tips of the brown feathers of the head, neck, and back are in part of a clear white; the larger upper tail-coverts are whitish near the base, and near the tip light brown-mottled; the smaller upper tail-coverts are brown, tipped with whitish spots; the light tips of the feathers of the underparts, which are generally of a uniform brown, are not pure white, but light ferruginous. The primaries are at the ends nearly black for about two thirds of the length, at least dark brown without any trace of grey. Salvadori has mentioned a similarly different coloration in describing some young specimens from Halmahera. It is particularly striking that the tail of our individual is considerably longer than the measure given by Salvadori, as also than those of two old birds of the Brunswick Museum, one of which we have received with the general indication 'Moluccas' from Mr. G. A. Frank, in Amsterdam, while we owe the other, coming from Gorontalo on the island of Celebes, to the kindness of Mr. G. Schneider, of Basle.

The following table will show the difference :—

	Long. tot. cm.	Al. cm.	Caud. cm.	Rostri culm. cm.	Tars. cm.
Salvadori, minimum	70·0	54·5	22·5	5·2	9·0
„ maximum	80·0	57·5	25·5	5·5	9·5
Moluccas, ad.	68·0	56·5	23·5	5·2	9·0
Celebes, ad.	61·5	55·5	21·0	5·0	9·0
Ceram, juv. ♂	72·5	55·5	31·5	4·7	9·3

(In the Catalogue Birds Brit. Mus. vol. i. Sharpe also states the length of the tail as much less—for the male ad. 9·5 inches=24·2 cm., and for the female ad. 11 inches=27·1 cm.)

At first I believed, on account of these widely differing proportions, and particularly on account of the much longer tail, that I had before me another species of the group of *Haliaetus*. But this supposition is contradicted by the fact that, till now, no other species has been found in the region of the Moluccas, and that this very same species has been found by Hoedt on the island of Ceram (Schlegel, Mus. Pays-Bas), and observed by Rosenberg (Malayischer Arch. p. 322) near the mouth of the Bobot river.

Besides, the feathering of the leg (only in front on the upper third of the tarsus), the formation of the scales (in front a row of very broad plates descending nearly to the root of the toes), and the formation of the claws are exactly the same as in the old specimens mentioned above. Of the other species of *Haliaetus* very well represented in the Brunswick Museum, the longer-tailed *H. leucoryphus* (Pall.) approaches the nearest in size and formation of tail and legs. But our specimen from Ceram differs from it, apart from the different colouring, in the wider and deeper descending scales of the tarsus, and in the smaller development of the hind claw. I propose therefore to classify the bird for the present as *H. leucogaster*, and suppose that this species has when young a considerably longer tail than when old, and that the average measurements of Salvadori have been taken exclusively from old individuals. With this opinion coincide more or less the opinions of Mr. E. F. von Homeyer of Stolp, of Dr. Alph. Dubois of Brussels, of Dr. Rud. Blasius of Brunswick, and of Mr. Henry Seebohm of London, the first three of whom have at my request seen and compared the bird with *H. leucoryphus*, and distinctly stated the difference. I also owe to the just named gentlemen, principally to Mr. H. Seebohm, on this occasion some private communications about the variability of the length of tail in the large birds of prey in general, and about the often surprisingly greater dimensions of the plumage of the young individuals of Accipitres in comparison with the old ones, which have essentially confirmed me in classifying the present specimen as *H. leucogaster*.

The specimen is in the Brunswick Museum.

l. c. p. 416, sp. 8). The variations of colour which f
occur in this species are inconspicuous here.

7. Coriphilus placens (Temm.), Salvad. i. p. 303.

Seven specimens (three males and four females). For all,
repeats:—"Native name, Pörkietschi Klapa. Iris oran
cere, feet red. Lokki, Ceram."

1. "♂. L. 18 cm., D. 5·0 cm. 20 November 1881.
2. "♂. L. 18 cm., D. 4·5 cm. 23 November 1881.
3. "♂. L. 18 cm., D. 4·5 cm. 24 November 1881.'
4. "♀. L. 18 cm., D. 4·5 cm. 18 November 1881.
5. "♀. L. 18 cm., D. 4·5 cm. 23 November 1881.
6. "♀. L. 18 cm., D. 4·5 cm. 23 November 1881.'
7. "♀. L. 18 cm., D. 4·5 cm. 27 November 1881.

The comprehensive remarks of Salvadori upon the spe
racters and differences of sex, and the variety found in
well as about the near relation of this species to *Coriphil*
laceus, &c. are confirmed by Dr. Platen's specimens.

The native name given by Dr. Platen has not yet been
Salvadori.

Nos. 1 and 7 are in the Brunswick Museum, Nos. 3 an
collection of Mr. Nehrkorn.

8. Rhytidoceros plicatus (Penn.) [=*ruficollis* (Viei
vad. i. p. 392.

Nine specimens (five males and four females). For all,
repeats:—"Skin round eyes light blue, at the throat bluish w
black. Lokki, Ceram."

1. "♂. Iris orange. L. 88, D. 18 cm. 17 Nov. 1881." (
the
2. "♂. " L. 88, D. 18·5 cm. 21 Nov. 1881." (
3. "♂. " L. 90, D. 19 cm. 27 Nov. 1881." (
4. "♂. " L. 88, D. 19 cm. 29 Nov. 1881." (
an
5. "♂. " L. 91, D. 21 cm. 2 Dec. 1881." (
6. "♀. Iris grey-brown. L. 82, D. 18 cm. 21 Nov. 1881." (
7. "♀. " L. 80, D. 17·5 cm. 30 Nov. 1881." (
8. "♀. " L. 83, D. 18 cm. 1 Dec. 1881." (
9. "♀. " L. 79, D. 17 cm. 5 Dec. 1881." (

The species stands systematically very near to *Rhy*
undulatus (Shaw) [=*obscurus* (Gm.)], of which species D
lately sent 12 specimens from Borneo, labelled with e
(Blasius and Nehrkorn, 'Contributions to the Knowledg
Birds of Borneo,' Brunswick, 1881, sp. 27, p. 23; in th
Report of the Society of Natural Science of Brunswick for
1880–81, p. 129)[1].

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[1] *Rectiùs*—Blasius und Nehrkorn, 'Beiträge zur Kenntniss der
von Borneo,' Braunschweig, 1881, sp. 27, p. 23; in 'Jahresbericht
für Naturwissenschaft zu Braunschweig für das Geschäfts-Jahr 1880–

The females of *Rh. undulatus* sent from Borneo by Dr. Platen strikingly resemble the females of *Rh. plicatus.* I have already drawn attention to the fact that the ridges on the sides of the base of the bill are very little or even not at all marked in young specimens of *Rh. undulatus*; so that the characteristic features on which Salvadori (i. p. 398) chiefly founds his belief in the possibility of distinguishing the females of the two species may be entirely obliterated. Under these circumstances it appears to me not superfluous to point out some differences in the colouring of the iris and the naked parts, which are founded on Dr. Platen's careful observations.

Rh. undulatus. Female: "iris (like that of the male) orange. Naked skin of the throat—front third light blue, back third dark blue, separated by a black band; while the old male has the back third of the throat-skin light green, the front one yellow, divided by a dark green stripe; and the young male has a uniform lemon-coloured throat-skin, or a lemon-coloured one divided by a yellowish-green stripe."

Rh. plicatus. Female: "iris grey-brown (of the male orange). Naked skin of the throat (like that of the male) bluish white."

The difficulty of the distinction exists only for the female, which is in both species entirely black with the exception of the white tail; while the male of *Rh. plicatus* is easily to be distinguished from *Rh. undulatus* by the completely brown-red neck (the present specimens from Ceram have a dark chestnut-brown colouring towards the back, lighter towards the front, and lightest on the chin). The female of the present species is much smaller than the male, as is already proved by the measurements taken by Dr. Platen while the birds were fresh. To render these differences more obvious, as well as to give the possibility of comparison with some measurements of *Rh. undulatus*, I add the following dimensions:—

	Cauda. cm.	Ala. cm.	Tarsus. cm.	Rostri crista. cm.	Rictus. cm.
1. ♂.	28·5	42·7	5·2	13·0	22·0
2. ♂.	27·5	40·5	5·5	13·0	21·2
3. ♂.	29·5	41·5	5·5	13·3	22·0
4. ♂.	28·0	43·0	5·8	11·5 to 13 cm.	22·2
5. ♂.	27·5	41·5	5·5	11·8	21·6
6. ♀.	27·3	41·0	5·0	10·7	18·3
7. ♀.	28·0	38·5	5·0	12·0	17·3
8. ♀.	26·5	39·0	5·3	11·3	19·1
9. ♀.	26·8	40·0	5·2	9·1	17·4

Nos. 4 and 8 are in the Brunswick Museum; Nos. 1 and 7 in the Museum Heineanum; No. 2 in the collection of Mr. Nehrkorn.

9. ALCEDO ISPIDOIDES, Less., Salvad. i. p. 408.

"*Male.* Iris brown. L. 15·5 cm., D. 2 cm. Bill black, feet red-brown. Lokki, Ceram, 20 November 1881."

The specimen exactly agrees with the description of Salvadori, and with another bird before me (female) which Dr. Platen has sent from Amboina (cf. Blasius and Nehrkorn, "Dr. Platen's ornithologische Sammlungen aus Amboina," Verh. zool.-bot. Ges. Wien, xxxii. 1882, p. 418, sp. 12): both are still young, as appears from the bluish borders of the red feathers of the breast. The Brunswick Museum possesses an evidently old specimen of the same species from Celebes, which has no blue borders to the feathers of the breast, but a more conspicuous red spot above the lores and a more bluish shade on the head.

The nearly related species *A. bengalensis*, Gm., of which the Brunswick Museum possesses a specimen (male) from the East Indies, purchased from Verreaux, has a more greenish tint on the back; the pretty large spot above the lores and a stripe which begins beneath the eyes and runs backwards are of a clear brown-red, of the same colour as the underside.

The specimen is in the Brunswick Museum.

10. CEYX LEPIDA, Temm., Salvad. i. p. 417.

"*Male.* Iris brown. L. 14 cm., D. 1·8 cm. Bill and feet coral-red. Lokki, Ceram, 22 November 1881."

The specimen is still young, as is evident by the smaller development of the blue spots on the head, and the paler colouring of the brownish spot on the lores, in comparison with four old birds of the same species now before me which Dr. Platen has sent from Amboina. (cf. Blasius and Nehrkorn, tom. cit. p. 418, sp. 13). The Brunswick Museum possesses one specimen of the same species from Batchian, which in its much darker and less conspicuous spots on the head, and its more intensely red-brown underside, coincides exactly with that variety of colouring which is described by Salvadori for the group of Halmahera.

The specimen is in the Brunswick Museum.

11. CYANALCYON LAZULI, Temm., Salvad. i. p. 461.

Three specimens (♂)—(1) "Nov. 18, 1881," (2) "Nov. 29, 1881," (3) "Nov. 30, 1881." For all the label repeats:—"*Male.* Iris brown. L. 20 cm., D. 4 cm. Bill and feet black. Lokki, Ceram."

The more ample material sent by Dr. Platen (besides the three males from Ceram, I have before me four males and two females from Amboina, with exact description of sex by the hand of the collector) gives me occasion to point out an evident mistake of Salvadori in the descriptions of male and female, into which he has certainly been led by the paucity of material before him. (He had only one specimen, evidently wrongly labelled "male," from Amboina in the Museum of Genoa, and another, probably equally wrongly marked "female," in the Museum of Turin.)

Already Schlegel mentions in the 'Mus. Pays-Bas' (Alcedines, p. 42), "Mâle, à poitrine blanche;" and in the 'Revue' (p. 31):—"Jeune femelle, poitrine blanche, comme dans les mâles, mais commençant à prendre la teinte d'un bleu-vert du ventre." Salvadori, on the contrary, describes mistakenly:—

1. *Mas.* "Gutture albo; gastræo reliquo pallide cæruleo (♀?)."

2. *Fœm.* "Mari simillima, sed subtus alba, abdomine imo tantum cæruleo (♂?)."

3. *Mas. jun.* "Fœminæ similis, sed colore albo pectoris partim cæruleo tincto (♀ jun.?)."

I am of opinion that, judging from the seven males and two females of Dr. Platen's, the description of Salvadori for No. 1 would be that of a female, for 2 that of a male, and for 3 that of a young female as Schlegel describes it.

The three males from Ceram have the underparts in the rather larger front half white, and in the rather smaller hind part blue; in the middle line the blue colour of the belly has with the addition of the blue under tail-coverts a length of about 5·5 to 6·5 cm., while in the two females from Amboina before me the blue of the underparts, which extends up to the breast, has a length of 8 to 8·5 cm.

Dr. Platen's remarks about the sex, which are evidently correct, are so much the more valuable, as many specimens in different museums seem to be kept under a wrong statement of sex, like the two specimens in the Museum of Lubeck mentioned by Dr. Lenz (Caban. J. f. Orn. 1877, p. 368), which are also, as I believe, wrongly labelled, as the just-named author communicates to me.

No. 2 is in the collection of Mr. Nehrkorn.

12. SAUROPATIS CHLORIS (Bodd.), Salvad. i. p. 470.

Two specimens—1. "♂. Dec. 4, 1881;" 2. "♀. Nov. 21, 1881." For both, the labels say:—"Iris brown. L. 24 cm., D. 4·5 cm. Bill black; reddish-white spot on the under mandible; feet dark brown. Lokki, Ceram."

Both are young specimens, with a brownish-yellow shade on the underparts and the band of the neck, and with light brownish colouring of the light spots of the lores and on the tips of the forehead-feathers, and numerous little dark borders on the breast-feathers. The brownish colour and the black bordering of the breast-feathers are more conspicuous in the female (No. 2) than in the male (No. 1); for which reason the first (which, on account of the dirty-green upper part, bears a great resemblance to *Sauropatis sordida*, Gould) should be regarded as the youngest of the two specimens, notwithstanding the greater length (about a few millimetres) of the wings and bill. The Brunswick Museum possesses three specimens from Celebes, on the two old birds of which the white appears clear, while the third resembles the young male from Ceram. The supposition of Dr. Lenz (Caban. J. f. O. 1877, p. 367) that *S. sancta* (Vig. & Horsf.) might only be the young bird of *S. chloris* (Bodd.), will hardly be confirmed (cf. Blasius and Nehrkorn, tom. cit. p. 431, sp. 16).

No. 2 is in the Brunswick Museum.

13. Monarcha inornatus (Garn.), Salvad. ii. p. 14.

Two specimens (1. "♂," 2. "♀"). For both, the label repeats:—"Iris brown. L. 16 cm., D. 4 cm. Bill and feet of a beautiful bluish grey. Lokki, Ceram, Nov. 25, 1881."

This species is *new* to the ornithology of Ceram. I have before me for comparison one sample from the Brunswick Museum, received from Batchian, and three specimens sent at the same time by Dr. Platen from Amboina (cf. Blasius and Nehrkorn, tom. cit. p. 422, sp. 18). The specimens from Batchian and Ceram have a little lighter grey colouring on the head and breast than the three birds (all males) from Amboina; and the individuals just named show distinctly a small number of black feathers on the front and chin, which are scarcely to be remarked on the others. The female from Ceram has in the dried skin a nearly yellowish white bill, at least in the front half; while the five other specimens (all labelled male) show distinctly the bluish-grey or grey colouring nearly up to the end.

No. 1 is in the Brunswick Museum.

14. Muscicapa griseosticta (Swinh.), Salvad. ii. p. 80.

"*Male.* Iris dark brown. L. 12 cm., D. 2 cm. Bill and feet dark brown. Lokki, Ceram, Nov. 29, 1881."

Salvadori has only mentioned *Muscicapa griseosticta* (Swinh.) and *Erythrosterna luteola* (Pallas) among the true Flycatchers of the fauna of the Moluccas, &c. As, on account of the greater size and the entirely different colouring of the present specimen, the last species seems totally out of the question, I have labelled this bird at once as *M. griseosticta*, a determination since confirmed by Mr. E. F. von Homeyer and Count Tommaso Salvadori.

It coincides in general very well with the descriptions of Swinhoe, Salvadori, and Sharpe (Cat. Birds Brit. Mus. iv. p. 120, 1879), except only that the colour of the tail and quills should not be represented as blackish but rather as dark brown, and the brown-grey plumage has in many places (principally on the nape, on the middle of the back, the tail-feathers and upper wing-coverts, and the shoulder-feathers) numerous fine white spots which are bordered with a dark-brown edging. Such spots are described as characteristic of the plumage of the young of various allied species of *Muscicapa*, especially of *Muscicapa sibirica*, Gm., to which species[1] the example from Ceram has a striking resemblance in the markings of the chin, throat, breast, and belly. I consider therefore, according to analogy with *M. sibirica*, the specimen sent by Dr. Platen from Ceram to be a young bird of *Muscicapa griseosticta* (Swinh.). I have nowhere found in the literature at my disposal (especially neither among Salvadori's publications nor in Sharpe's Cat. Birds Brit. Mus.) the description of the plumage of youth of this species. On that account the above remarks about the delicate little white drop-like spots as characteristic of youth may be of interest. That an identification of these allied species, on account of the great resemblance in the markings between *M. griseosticta* and *M. sibirica*, which at first occurred to me, is unlikely, I conclude from the greater length of the bill of the first species in comparison with the last, at least from the comparison of the measurements taken on the specimens before me and those noted by Sharpe.

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[1] I use for comparison an old male specimen of *Muscicapa sibirica*, Gm., derived from the collection of my late father, and collected June 4, 1869, on the southern part of Lake Baikal, which is in the Brunswick Museum.

Mr. E. F. von Homeyer, too, has had the kindness to compare the specimen in question with his skins of *Muscicapa sibirica*, and states that *M. griseosticta* essentially differs from *M. sibirica* not only in the larger, more elongated bill, which is narrower at its base, but in its wings, which are longer by some millimetres. With this statement coincides (with the exception of those of Salvadori, especially with respect to the length of bill of *M. griseosticta*) the following table of measurements, in which I have reduced the English inches into centimetres:—

	Long. tot.	Al.	Caud.	Culm.	Tarsi.
	cm.	cm.	cm.	cm.	cm.
M. griseosticta (Sharpe)	13·5	8·3	5·3	1·27	1·27
„ (♂, Ceram, Platen)..	12·0	8·5	5·0	1·2	1·25
„ (Salvadori)	14·0	8·2	5·3	0·9	1·4
M. sibirica (Sharpe)............	12·5	8·0	5·6	1·02	1·27
„ (♂, Baikal, Mus. Brunsw.)	12·6	8·1	5·8	1.1	1·3

It is surprising that Salvadori, evidently by mistake, should give the length of bill of *M. griseosticta* as only 0·9 cm. (the culmen must be meant), shorter than even the least of those of the culmen of *M. sibirica*, while Sharpe has even placed the two species, on account of the different shape of the bills, in two different genera (*Muscicapa* and *Hemichelidon*).

Furthermore, it was particularly striking to me to find that the character which Schrenck and Radde, who both have observed great numbers of *M. sibirica* in Siberia together with the similarly coloured *M. latirostris*, Raffl. (*M. cinereo-alba*, Temm. & Schl.), have remarked as of greatest importance for *M. sibirica*, in contrast to the last-named species, viz. that the first (spurious) quill has about a line less of length than the upper wing-coverts, is found very clearly marked in the *M. griseosticta* from Ceram lying before me; while the species of the genus *Muscicapa* under which Sharpe has placed *M. griseosticta* (at least the European kinds *M. grisola*, *M. atricapilla*, *M. collaris*, and *M. parva*) which I have examined possess a first quill which is much broader and sometimes considerably longer than the upper wing-coverts.

I have nowhere found recorded any remarks showing how the first quill of the *M. griseosticta* ought to stand in this respect; and I owe to a kind communication of Mr. Henry Seebohm (who himself, however, does not possess a specimen of *M. griseosticta*) the statement that in this species generally the first quill is smaller than the upper wing-coverts. I am almost led to believe that on account of this similarity of the first wing-feather, *M. griseosticta* should be classified in the same genus with *M. sibirica* notwithstanding the different shape of the bill.

The specimen is in the Brunswick Museum.

18. CARPOPHAGA NEGLECTA, Schleg. Ned. Tijdschr. Dierk. iii. pp. 195, 344 (1865); Mus. Pays-Bas, *Columbæ*, p. 90; Salvad. Prodr. Orn. Papuas., Ann. Mus. Civ. Genova, ix. p. 201, sp. 46; Lenz, J. f. O. 1877, p. 377, sp. 58; Rosenberg, Malayisch. Arch. 1879, p. 323.

"*Female.* Iris brown. L. 42 cm., D. 9 cm. Bill blue-grey; feet and cere reddish violet. Lokki, Ceram, 26 Nov. 1881."

This species has been as yet observed only in the islands of Ceram, Amboina, and Boano[1]; it is a representative of the nearly related *C. perspicillata* (Temm.).

The specimen is in the Brunswick Museum.

19. MYRISTICIVORA MELANURA, G. R. Gray, Salvad. Prodr. Orn. Papuas., Ann. Mus. Civ. Genova, ix. p. 203, sp. 56; ibid. viii. p. 381, sp. 36.

M. bicolor (Scop.), Schlegel, Mus. Pays-Bas, *Columbæ*, p. 98; Lenz, J. f. O. 1877, p. 379, sp. 62; Rosenberg, Malayisch. Arch. 1879, p. 323.

Five specimens (three males and two females). For all, the label repeats:—"Iris brown. Bill and feet blue-grey. Lokki, Ceram."

1. "♂. L. 36 cm., D. 6 cm. 25 Nov. 1881. Cere blue-grey."
2. "♂. L. 37 cm., D. 6 cm. 25 Nov. 1881."
3. "♂. L. 37 cm., D. 6 cm. 16 Dec. 1881. Cere blue-grey."
4. "♀. L. 37 cm., D. 6 cm. 25 Nov. 1881."
5. "♀. L. 37 cm., D. 6 cm. 3 Dec. 1881."

I place this species under the name *melanura*, Gray, because Salvadori in his 'Prodromus,' too, separates this species and the nearly allied *M. spilorrhoa*, Gray, from *M. bicolor* (Scop.). Schlegel unites the three forms in the 'Mus. Pays-Bas' (*Columbæ*, p. 98) under the original name *M. bicolor*, and justifies this by the statement that the extent of the black and the white on the feathers of the tail, and the formation of the black spots on the lower tail-coverts and on the feathers of the lower abdomen are very variable, so that no species could be founded thereon. As I have only before me some specimens from Ceram, and one specimen (male) sent by Dr. Platen from Amboina (cf. Blasius and Nehrkorn, tom. cit. p. 429, sp. 32), which have all been regarded as *M. melanura* by Gray and Salvadori, I have not the possibility of comparison with the other forms. But it is certain that some of the specimens before me, in particular No. 2, shows so great an extension of the white on the tail-feathers that they do not conform to Gray's original diagnosis of *M. melanura*.

In No. 2 the white on the two external tail-feathers protrudes far beyond the shaft on the outer web, so that in some places only a dark stripe of about 1 mm. width is left; and at the tip the darker colouring extends only about 1 cm. down, and on the left side can be called only a "whitish grey." No. 3, on the contrary, has a decidedly black tail; the white of the inner web of the outer tail-feathers protrudes only for about 1·5 mm. on outer web and does not reach the tip by 3 cm. This last bl tailed specimen possesses only twelve tail-feathers (if two featl are absent on account of moulting, they are at any rate not outer ones), while all the other specimens, as also the one f Amboina, have fourteen (or thirteen) tail-feathers.

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[1] A small island near Ceram.

The male (No. 1) and the two females from Ceram, as well as male from Amboina, are very like each other with regard to colouring of the tail, and stand nearly exactly intermediate betw the white-tailed (No. 2) and the black-tailed specimen (No. With regard to the black spots on the lower abdomen and u tail-coverts, the white-tailed male (No. 2) does not show them, w No. 1 has only a slight trace of them on the belly and dist black apical spots on the tail-coverts. The spots are a little distinct in the female (No. 5), but exist in both places; while male (No. 3) has strongly marked spots only on the belly, and female (No. 4) has them only on the tail-coverts. The r from Amboina is similar to No. 3.

I will only add that in the female (No. 5) among the incomp tertiaries, the rest of which are white, *one* feather on the left s standing in the midst of the white ones, appears exceptionally aln as blackish as the tertiaries of *M. luctuosa* generally are.

The last three specimens Nos. 3, 4, and 5 have been retained the Brunswick Museum.

20. MEGAPODIUS FORSTENI, Temm., Schlegel, Mus. Pay- *Tinami* (1880), p. 70; Salvad. Prodr. Orn. Papuas., Ann. Mus. Genova, xviii. p. 7, sp. 5 (1882).

"*Male.* Iris dark brown. L. 34 cm., D. 1 cm. Bill h brown. Skin round eyes black, feet dark brown. Lokki, Ce 29 Nov. 1881."

The specimen is exactly similar to a male of the same species by Dr. Platen from Amboina and at present before me (cf. Bla and Nehrkorn, tom. cit. p. 430, sp. 35). *M. forsteni* di from the nearly allied species *M. freycineti*, Quoy et Gaim., re sented in the Brunswick Museum, in the somewhat different shad colour of the plumage (which is on the whole uniformly brown), in its somewhat smaller size.

The specimen is in the Brunswick Museum.

21. BUTORIDES JAVANICA (Horsf.), Salvadori, Prodr. Orn. puas., Ann. Mus. Civ. Genova, xviii. p. 334, sp. 61 (1882).

Ardea javanica, Horsf., Finsch, Neu-Guinea, p. 183; Rosenb Malayisch. Arch. 1879, p. 324.

"*Female.* Iris golden yellow. L. 40 cm., D. 1 cm. Bill bl Skin round eyes and feet yellowish. Lokki, Ceram, 19 1881."

The specimen has uniform black-green lustrous feathers on head, some of which form a long crest, and broad ferruginous edg to the upper wing-coverts. In the Brunswick Museum, one specimen without indication of sex from Celebes and one male from Halmahera are found, which have a similar plumage.

The specimen is in the Brunswick Museum.

Brunswick, Ducal Museum of Natural History,
October 1882.

3. Description of a new Species of Flycatcher of the Genus *Monarcha* (*Piezorhynchus*) from the Solomon Group. By E. P. Ramsay, F.L.S., C.M.Z.S., &c., Curator of the Australian Museum, Sydney.

[Received November 13, 1882.]

MONARCHA (PIEZORHYNCHUS) BROWNI, sp. nov.

All the upper surface, wings and tail, throat and chest glossy blue-black; the feathers of the throat elongate, lanceolate; the breast, axillaries, abdomen, and under tail-coverts white; the terminal fourth to third portion of the outer four tail-feathers white[1]. A triangular patch of white from near the angle of the mouth below the eye, widens and extends down the sides of the neck; a broad patch of white on the wings, extends over the median coverts and tips of some of the adjacent smaller coverts; the shoulders are black like the back; the primary quills and the inner webs of the secondaries are blackish brown; the under surface of the wings, the basal portion of the feathers of the hind neck and interscapular region are dark brown.

Bill bluish black, rictus black, legs lead-blue.

Total length 7 inches, wing 3·5 in., tail 3·2 in., tarsus 0·8 in., hind toe 0·4 in.; bill from the forehead 0·7 in., from nostril 0·45 in., from gape 0·75 in.

Hab. "Marrabo," Solomon Islands.

Remarks. This fine species is remarkable for the large patch of white on the neck, which commences just below the eye, tips a few of the lower ear-coverts with white, and expands out in a triangular form on the side of the neck, but does not reach the chest. The species comes near to *Piezorhynchus brodiei* (Ramsay), but is a larger bird and has a greater extent of black on the chest. It was obtained by some of the Rev. George Brown's collectors at "Marrabo," one of the Solomon Group.

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[1] The fifth feather on one side only has a spot of white on the inner web.

4. On the Acclimatization of the Indian Mungoos in Jamaica. By W. Bancroft Espeut, F.L.S.

[Received November 13, 1882.]

In 1871 the loss in sugar-cultivation in Jamaica from the ravages of rats was so great that I was convinced that something more than poison, traps, &c. was required to reduce it, if sugar-culture was to continue. For nearly 200 years the sugar-planters have had to contend with this serious difficulty; and on most estates from £200 to £300 a year have been expended in destroying the rats by poison, traps, and baits, and in ratcatchers and dogs. This expenditure, however, only represented a fraction of the loss resulting from the injury and destruction of the canes, and of the sugar they contained.

Besides the ordinary Black and Brown Rats of Europe, the Island was infested with the Grey Rat, or, as it is locally called, "Cane-piece Rat" (*Mus saccharivorus*). Whence the species came is known to no one; probably it is indigenous, as it is found in Cuba, Porto Rico, and other islands. The Brown and Black Rats cause comparatively small loss; but the Grey Rat is most destructive. Nesting in old stone walls, in holes in wet banks and tree-roots (but not on trees like the Black Rat), it falls an easy prey to terriers; but as dogs suffer much from injuries to their eyes in traversing cane-fields, owing to the serrated edges of the leaves and the spines on the young plants, it was futile to expect much relief from them.

More than 100 years ago Sir Charles Price, then a large sugar-planter, introduced ferrets and English rat-catchers; but the ferrets were destroyed by chigoes, and were of little use. Tradition says Sir Charles Price then obtained from Central America some other animal; but nothing is certainly known about this; certainly no animal belonging to the Musteline group exists in the island. Confounding the ferrets with the Grey Rat, the negroes appear to think Sir Charles Price introduced the latter; and, in consequence of this strange error, they even now call the Grey or Cane-piece Rat "Massa Price's Ratta."

In 1844 Mr. Anthony Davis imported from Barbadoes some two dozen Agua Toads (*Bufo agua*), in the hope that they would mitigate the rat plague. These toads were introduced from Cayenne into Martinique, and thence to Barbadoes, and were regarded as useful in destroying the young rats. But in Jamaica they certainly proved not only valueless, but a nuisance: the noise they make is most disagreeable; and they are very destructive to poultry, chickens, and eggs.

Sir Stamford Raffles, the first President of this Society, introduced into Jamaica from Cuba the *Formica omnivora*, now known locally as the "Raffle ant." This formidable insect certainly keeps

5. On Specimens of the Male and Female of *Phasianus humiæ*, from Munipur, with a Description of the latter. By Lieutenant-Colonel H. H. Godwin-Austen, F.R.S., F.Z.S., &c.

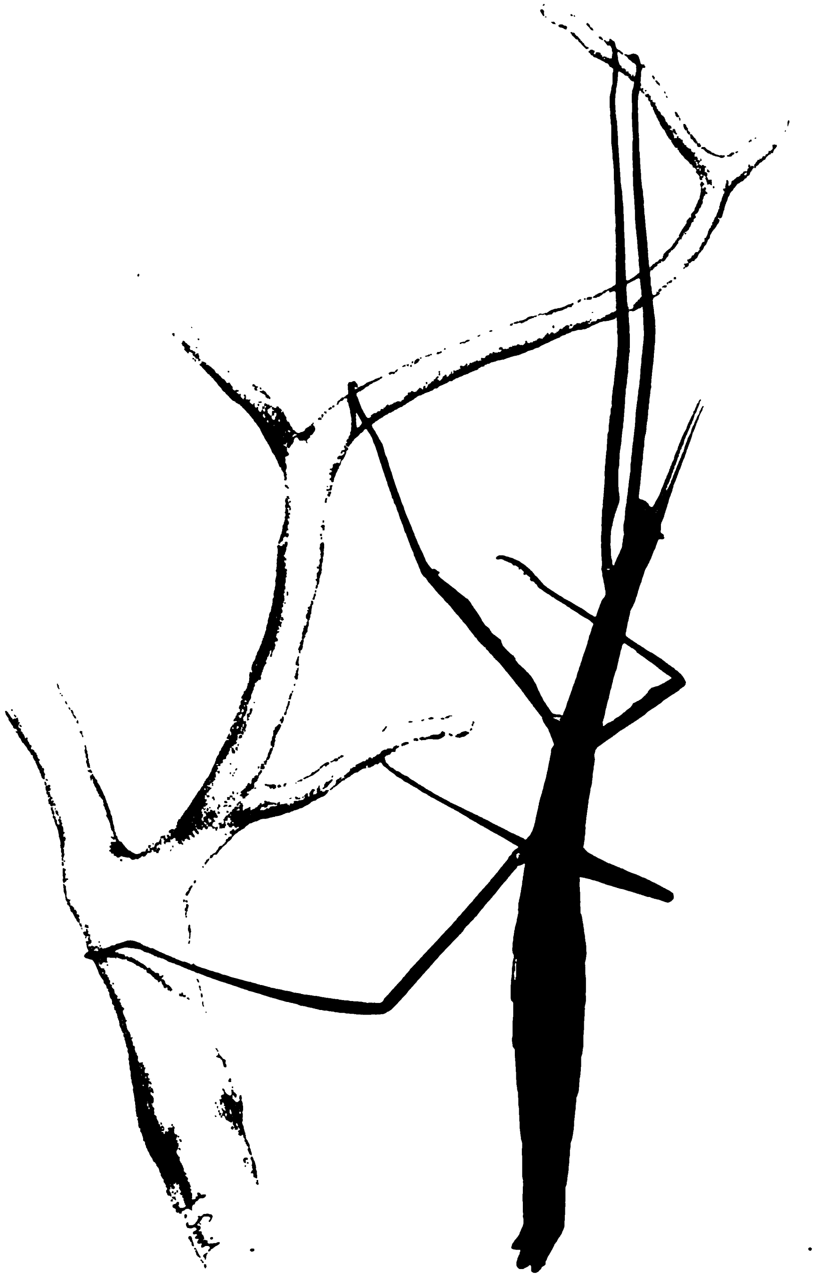
[Received November 21, 1882.]

(Plate LI.)

The two specimens of *Phasianus humiæ* which I have the pleasure of exhibiting this evening were obtained by Mr. M. Ogle, of the Topographical Survey of India, on the peak of Shiroifurar, in North-east Munipur, upon the Naga-hills boundary—a great mass of peculiar dark-green trap-rock which rises here through the sedimentary rocks to an altitude of about 9000 feet. It was the last point on that side that I reached myself in 1873, when surveying the boundary along with the political officers, Col. Mowbray Thomson and Capt. John Butler. I then collected some very interesting birds and land-shells; but although that winter we got specimens of *Ceriornis blythi*, we neither saw nor heard of this beautiful Pheasant. Nor was Tangal Major (who was attending us on the part of the Raja of Munipur) then wearing its feathers as an ornament in his head-dress; or we should have been very soon on the look-out for the bird. Mr. Ogle, to whom my best thanks are due, writes from Munipur thus:—"I got two capital Pheasants here, which Nagas had trapped on Shiroifurar, badly skinned; or rather the flesh had been left on the wings and would have gone bad; but I had them skinned and turned inside out, and took out all the flesh. Tangal Major, to whom the Nagas brought the birds, made them over to Trotter, the acting Political Agent; and the latter kindly gave them to me when I told him I was collecting for you." Our thanks are therefore due to all three for the sight of these interesting birds here this evening. Mr. Ogle continues:—"I was at Shiroifurar for about a week, and had men out every day, but was not fortunate enough in getting any thing of this sort." This is not to be surprised at; for the forest is very heavy, and it is a mere chance coming upon any birds and seeing them in the underwood.

The discovery of *Phasianus humiæ* in the northern hills gives it a much more extensive range than Mr. Hume supposed; and we have, I expect, both walked over the bird many a time. It is no doubt to be found throughout the Munipur hills on the north-east, and very probably extends up the Jhiri valley, nearly to the Burrail range.

The male bird was first obtained by Mr. Hume to the south of the Munipur valley, apparently with a good deal of trouble, of which he gives the history in 'Stray Feathers,' vol. ix. p. 463; and I extract his description of the male bird in full. The interesting point of the present communication is the description of the female, before unknown, which I am now fortunate in being able to draw



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Hanhart

BACILLUS PATELLIFER, ♀

p. 328[1]). The ova of this insect were sent to England by Mr. J. Wood-Mason, F.Z.S., to whom the Society is indebted for many interesting additions to the collection of insects.

The ova were received from Cachar in October last year, and were at once placed in one of the glass cases containing a young growing orange-tree and some grass. The young insects did not emerge till March of the present year; and I regret to say that most of them died when a few days old. One specimen, however, is still living and doing well. When young it fed upon grass; but when nearly half-grown it began to devour the leaves of the orange-tree; and it and one other specimen which died almost denuded the tree of its leaves.

The specimen now living is a female, it having quite recently laid eggs, and is therefore, I have no doubt, quite adult. It has shed its "skin" several times since it emerged from the egg, the last occasion being the 27th June, but has not shed its skin since that time. The last three shed skins (which are not quite perfect) were shed at intervals of about one month; these I beg leave to exhibit herewith, together with a sketch of the living insect (Plate LII.), the eggs recently laid, and also the specimen which died when nearly half-grown, and two specimens showing the size of the insect when first hatched. The young are very active, and climb up the surface of the glass easily.

The operation of shedding the "skin" is very simple: the skin splits down the back; and the insect gradually draws out its legs and body, and at once crawls away, leaving the shed skin quite moist and limp.

The specimen at present living did not eat for some time before laying the eggs, but since then has commenced to feed again.

December 19, 1882.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions made to the Society's Menagerie during the month of November 1882:—

The total number of registered additions to the Society's Menagerie during the month of November was 96, of which 1 was by birth, 58 by presentation, 17 by purchase, 5 were received in exchange, and 15 on deposit. The total number of departures during the same period by death and removals was 109.

The following additions are of special interest:—

1. A collection of Reptiles from the Western States of North America, presented by Samuel Garman, Esq., of the Museum of Comparative Zoology, Cambridge, Mass., U. S. A., November 3. Amongst these are examples of several species new to the Society's

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[1] As determined by Prof. Westwood from a drawing of the adult female living in the Gardens.—P. L. S.

collection. Mr. Garman writes to me as follows concerning this collection :—

"I sent by steamer leaving Boston, October 21, a box containing 4 *Holbrookia maculata*, 3 *Sceloporus undulatus*, var., 2 *Phrynosoma douglassi*, 1 *Pityophis sayi*, 2 *Crotalus confluentus*, and 1 *Eutaenia parietalis* from South-western Dakota; and 1 *Cistudo* [illegible] from N.E. Massachusetts.

"The *Holbrookia* is common in certain localities in South-western Dakota and North-western Nebraska. It is found on dry sandy flats and on sides of the Uplands.

"*Sceloporus* is found in the same section, but generally along grassy banks on the edges of gulches, in situations more moist than those chosen by the preceding.

"*Phrynosoma* was [illegible] represented here and there in restricted localities near *Sceloporus* and *Holbrookia*. Most often it was found on the sunny slopes along depressions that had been water-courses in the spring. Like the *Holbrookia*, they choose the hottest and driest places they can find. Their food in August consisted principally of ants and Coleoptera.

"*Pityophis sayi*, the 'Bull Snake,' is a common Serpent among the sand-hills of Western Nebraska.

"*Crotalus confluentus* was common in the Mauvaises Terres, but rare in the sand-hills. Residents asserted that they did not occur there; but the discovery of three specimens afterwards proved these assertions to be inaccurate.

"*Eutænia parietalis* is the common Water-Snake of the Dakota bad lands. They were so tame as to take fish from our sides when we were fishing, and would not let go even when the fish was taken in hand and shaken vigorously. Box Turtles are rarely met with so far north, though they have been taken in Maine."

The following species in Mr. Garman's collection are new to us:—

Holbrookia maculata,
Sceloporus garmani, sp. nov.[1]
Phrynosoma douglassi,
Tropidonotus sirtalis[2].

2. An Isabelline Lynx (*Felis isabellina*, Blyth[3]), presented by Capt. Baldock, R.A., and received November 23. Capt. Baldock, writing from Calcutta on the 30th of September, states that the Lynx was then some two or three months old, and had been obtained at Astor in Ballistan, about 100 miles north of Cashmere, from a villager.

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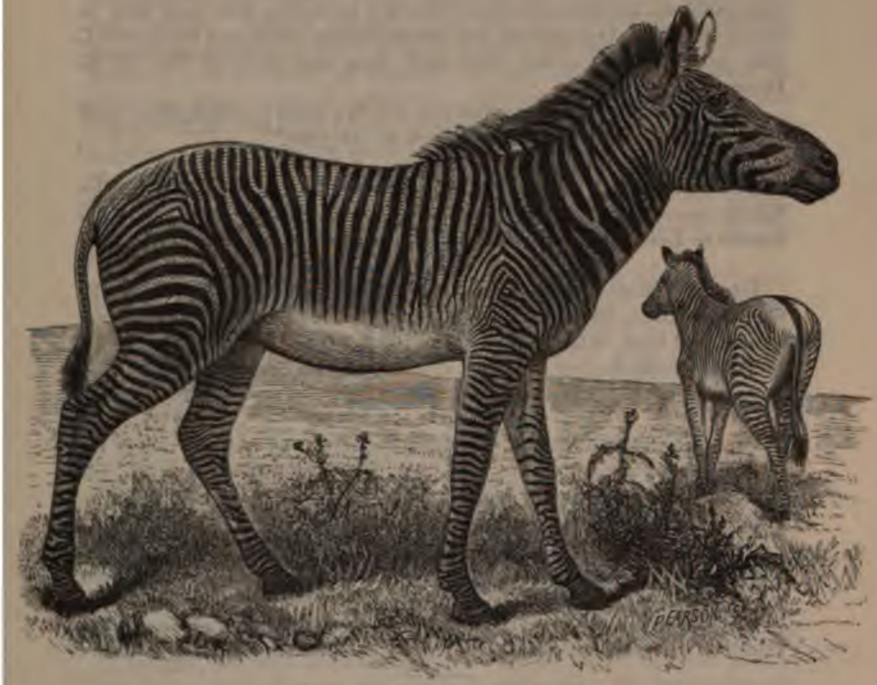
[1] Vide infrà, p. 761, Pl. LVI.

[2] *Eutænia parietalis* of Mr. Garman.

[3] Mr. Elliot unites the Lynx of Tibet and the adjoining districts to *F. lynx* of Europe. But I think it rather doubtful whether this is correct, and prefer to leave it for the present under Blyth's designation (J. A. S. B. xvi. pt. 2. p. 1178, et P. Z. S. 1863, p. 186).

Mr. Sclater exhibited some photographs of the new Zebra, lately named *Equus grevyi* by M. A. Milne-Edwards[1], F.M.Z.S., which had been sent to him by that gentleman, and pointed out the differences which separate this animal from the nearly allied *E. zebra*.

The single specimen of *E. grevyi* yet received in Europe had been sent alive by King Menelek of Shoa to the President of the French Republic, and deposited in the Jardin des Plantes, where, however, it had unfortunately lived but a short time.



Equus grevyi (from photographs).

Mr. Sclater added that Dr. Hartlaub had informed him that his correspondent, Dr. Emin Bey, Governor of the Equatorial provinces of Egypt, spoke of having met with great numbers of the "true Zebra" in Lattako. This "true Zebra" would doubtless turn out to be *E. grevyi*.

The Secretary exhibited, on behalf of Lord Lilford, F.Z.S., a skin of *Emberiza rustica*, and read the following letter on the subject:—

"On the morning of November 20 last, I received a small Bunting, the bird now exhibited, from Mr. Burton of Wardour Street, who informed me that it had been taken by a bird-catcher in his at Elstree Reservoir on Saturday, November 19. I received the in the flesh from Mr. Burton, along with a specimen of Reed-Bun (*Emberiza schœniclus* ♀), also in the flesh, for comparison. Lt.- Irby called shortly after I had received these birds, and we exam this specimen together, and had the advantage of comparing it a large series of Buntings in the collection of Mr. H. E. Dresser with some in my own collection. We came to the conclusion it is a Rustic Bunting (*Emberiza rustica*), of which species one specimen has hitherto been recorded as having been met wit Great Britian. Our opinion was subsequently confirmed by your who saw the bird in the flesh, and since that time by Mr. H Dresser.

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[1] See 'La Nature,' No. 470 (3 Juin 1882).

"Mr. Burton informs me that the bird is a male by dissection ; I think that it is undoubtedly a bird of the year."

The Rev. H. H. Slater, F.Z.S., exhibited an example of a Sh killed near Spurn Point in Yorkshire, which was believed to be ferable to *Lanius major* of Pallas, or to a dark variety of *L. excubi*

Dr. A. Günther, F.R.S., exhibited on behalf of Sir J. W Campbell Orde, Bart., F.Z.S., a specimen of a Charr (*Salmo alpi* which had been obtained in a loch on North Uist, Hebrides, b the first specimen ever obtained in this loch, and the third know have been obtained in the island.

Prof. Flower exhibited a photograph (presented to the Society Mr. James Farmer, F.Z.S.) of Seal Point, Farallone Islands, the coast of California, showing the immense number of lions (*Otaria gillespii*) frequenting that locality.

Mr. P. H. Carpenter exhibited and made remarks on s microscopical preparations of *Antedon eschrichti*, in which a ner plexus derived from the fibrillar envelope of the chambered organ visible at the sides of the ambulacra of the disk.

The following papers were read :—

1. On the Whales of the Genus *Hyperoodon*.

By William Henry Flower, LL.D., F.R.S., P.Z.S., &

[Received November 28, 1882.]

Apart from that indicated by the waterworn and imperfect cran from Australia, brought before the notice of the Society in l last[1], but one species of the genus *Hyperoodon*, as constituted Lacépède[2], has been generally recognized. This has long been kn under various specific names—*H. rostratus*, *bidentatus*, *dio*

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[1] See P. Z. S. 1882, p. 392.

[2] Histoire naturelle des Cétacés. Tableau des Ordres &c., p. xliv (1804)

bidens, *butskopf*, *dalei*, *borealis*, &c.[1]; and, though allied to *Berardius*, *Mesoplodon*, and *Ziphius*, and also, though less closely, to *Physeter*, its strongly marked differential characters have, since the early part of the century, thoroughly established its generic isolation.

It is well known to pass the summer months in the Arctic Seas which lie to the north of the Atlantic, and to migrate southward in the autumn, although its actual winter quarters do not seem to have been ascertained. Scarcely a year passes without one or more specimens having been taken or stranded on some part of the coasts of the British Isles, usually in the months of September and October. Similar captures have also been recorded upon other parts of the coasts of Eastern Europe, such as Norway, North Germany, Holland, and the north of France. From this point they seem to leave the shore; for no authentic instances are recorded of their occurrence on the west coast of France, or of Spain, or in the Mediterranean. Most of the specimens thus seen, or at all events taken, are solitary individuals, generally young; but not unfrequently two are met with together, an adult female accompanied by her young, the former often falling a victim to her maternal solicitude for the welfare of the latter.

Of the external characters of this common form of *Hyperoodon*, which usually attains a length of from 20 to 25 feet, many descriptions and drawings have been published; and there are few osteological museums of any importance which do not possess a skeleton of it. The earliest figure, made with really scientific accuracy, is that published by John Hunter in the 'Philosophical Transactions' for 1787, from the individual (a female 21 feet long) taken in the Thames in 1783, the skeleton of which is still preserved in the Museum of the Royal College of Surgeons.

Hunter, in his classical memoir on the Cetacea, says, speaking of this specimen:—"The one which I examined must have been young [as is proved by the condition of the skeleton]; for I have a skull of the same kind nearly three times as large, which must have belonged to an animal thirty or forty feet long." This skull has unfortunately not been preserved; but portions, evidently belonging to the same individual, are still in the Museum. Of these the anterior part of the lower jaw, of great density and containing the two teeth, the great age of which is attested by the solid condition of their bases, was catalogued by Professor Owen as that of an "immature" animal[2].

No notice appears ever to have been taken of Hunter's reference to this large specimen, or of the existence of any form of *Hyperoodon* different from that commonly known, and of which more detailed descriptions were given by Vrolik[3], Wesmael[4], Eschricht[5], Thompson, and others, until Dr. Gray, in the 'Zoology of the 'Erebus' 'Terror'' (1846), described and figured a cranium, received int British Museum from the Orkneys, as that of a distinct sp which he named *Hyperoodon latifrons* (p. 27 and plate 4). diagnostic character is:—"Skull large, heavy, solid, the reflexed of the maxillary bones very thick and thickened internally, s nearly to touch each other in front of the blower, much higher the hinder part of the skull;" whereas of *H. rostratus* it is st that "the elevated plates of the maxillary bones are thin, leavi broad space between them in front of the blowers, and as hig the frontal crest."

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[1] *Balæna rostrata*, Chemniz, Beschäft. der Berlin. Gesellschaft Naturforscher, iv. p. 183 (1779); *Delphinus bidentatus* and *Delphinus butskopf*, Bonnaterre, 'Cétologie,' p. 25 (1789); *Delphinus diodon*, Lacépède, 'Hist. nat. des Cétacés," p. 309; and *Hyperoodon butskopf*, idem, ibid. p. 319 (1804).

[2] Descriptive Catalogue of Osteological Series, vol. ii. no. 2480 (1853).

[3] Nat. Verhand. Maatsch. Haarlem, 2. Verz., D. 5 (1849).

Nouv. Mém. de l'Acad. Roy. de Bruxelles. xiii. 4. p. 1 (1841).

Untersuchungen über die nordische Wallthiere, 1849.

Professor Eschricht, who had devoted great attention to anatomy, development, and life-history of the Cetacea, expres in his valuable memoir on *Platanista*, the opinion that Dr. Gr *H. latifrons* was nothing more than an old male of the ordi form[1]. This opinion called forth a long rejoinder from Gray which he endeavours to show that males and females of both fo have been met with, and moreover states that "he was assured the fishermen who procured the head which he described figured that it was that of a female gravid with young."

So convinced was Gray of the distinction, that in 1863 (see P. 1863, p. 200) he constituted *H. latifrons* into a distinct ge called *Lagenocetus*, and retained it in this position in all his s sequent cetological writings.

Since the type specimen was described by Gray, not only sev skulls but also complete skeletons have been met with of the la form, a very fine specimen being mounted in the Copenhagen Mus and another at Caen. Although there is certainly nothing except and the form of the maxillary crests to distinguish them from more common form, there is so striking a difference in the shap the skull, that Dr. Gray's opinion, backed by the various statem made by him regarding the age and sex of the different individ recorded (all of which perhaps will not bear close investigation), induced many zoologists to agreed with him, at all events as the specific distinction, and to admit *H. latifrons* into the lis Cetaceous animals, sometimes as a doubtful and sometimes as a w determined species. I had, in fact, myself done so in the art "Mammalia" written in the beginning of this year for the 'Ency pædia Britannica,' being fortified in this opinion by some prema information derived from the same source as that which has dispelled this view (as mentioned in a note to p. 395 of the pre volume of our Proceedings), and especially because my friend the Prof. Reinhardt, whose recent death is a great loss to this branc zoology, had fully adopted Gray's view[3].

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[1] See the English translation in Ann. & Mag. Nat. Hist. ser. 2. ix. p. (1852).

[2] *Ibid.* p. 407.

[3] He says:—"Eschricht meente, som bekjendt, at *Hyperoodon latifrons* var opstillet paa den ret gamle Han af den almindelige Døgling, *Hyper rostratus*; men Gray's Art maa nu ansees for vel begrundet."—Vidensk. S Skr. 5 Række, naturvidens. og math. Afd. 9, B. 1 (1869).

On the other hand, Gervais, in the 'Ostéographie des Cétacés,' written in conjunction with Van Beneden, firmly maintained the specific identity of the two forms, citing cases of intermediate structure of cranium between the typical form of *H. rostratus* and that of *H. latifrons*, and affirming that all the specimens referred to the former were either females or immature males.

The importance of solving such a question is perfectly evident. It is indeed a pressing need in Cetology, as involving such an important point in the life-history of so common a British species, and also because, although Captain Gray's discovery of the commercial value of *Hyperoodon*-oil may give us for a short time ample means for investigating the subject, it will before long, it is to be feared, place it altogether beyond our reach.

It was last year that this enterprising seaman, who has already done so much to increase our knowledge of the Northern Cetacea, especially by the interesting description he has given us of the natural position in the mouth and mode of action of the baleen of the Greenland Whale (see 'Land and Water,' 1st December 1877) turned his attention to Hyperoodons or "Bottlenoses," which had hitherto in their native haunts enjoyed a happy immunity from the attention paid by whalers to the more gigantic members of their order. Observing their frequency in the seas which he visited in the pursuit of the Greenland Whale, the seas lying to the east of Greenland, between Iceland and Spitzbergen (which, by the way, was the original seat of the Greenland Right-Whale fishery, before it was mostly transferred to Baffin's Bay), he harpooned several specimens and brought back their oil. This, upon analysis, as related in the following communication, proved to be very similar to that of the Sperm-Whale, and probably of equal value for the special purposes to which that now scarce material is put, and for which, I believe, no efficient substitute has been found. The presence of spermaceti also in the head of the *Hyperoodon*, which has been affirmed and denied by previous investigators, was fully confirmed by Captain Gray's observations.

Hearing that Captain Gray intended this year to devote himself exclusively to the capture of "Bottlenoses," I called his attention to the interest of the subject, and to the great opportunities which he would have for solving the disputed question of the difference or identity of the two alleged species, and requested him carefully to note the sex and appearance of all the individuals killed which might throw light upon the question. How completely Captain Gray has carried out this object will be seen by his own communication, which, besides giving us for the first time any idea of the external characters of the adult male *Hyperoodon* (an animal never previously figured or described), must cause *H. latifrons* to be henceforth erased from the list of species, and the genus *Lagenocetus* to be consigned to a similar fate.

Besides the notes, Captain Gray has brought home tangible evidence of the correctness of his observations in a series of skulls, of which that of an adult male has been presented to the Museum of the College of Surgeons, and that of a young male to the University of Cambridge. The skull of a fœtal male, which was being towed overboard for the purpose of cleansing, was unfortunately lost; but next year it may be hoped that Captain Gray will have an opportunity of still further contributing to our knowledge of this interesting subject.

The presence of spermaceti in the head of the *Hyperoodon*, though subsequently denied by other observers, was noticed in 1779 by Chemniz, who in his account of a male taken near Spitzbergen says, after speaking of the oil, "Ausserdem aber auch aus seinem Kopfe und den übrigen Theilen einen Anker desjenigen reinsten Oels, so den Namen Wallrath oder *Sperma ceti* führet, gesammlet"[1].

Postscript.—Since the above note was communicated to the Society, I have re [illegible] ter from my friend Mr. Robert Collett, of the Christiania [illegible] giving some account of a specimen of *Hyperoodon latif* [illegible] ording to the common belief, he names it) which was w [illegible] at the Loffoden islands in April 1881[2]. He describes th [illegible] rfectly quadrangular, just like a "Kuffert" (portmante [illegible] unded angles, and altogether more like that of a *Physete* [illegible] ordinary *Hyperoodon*, the anterior part of the forehead b [illegible] ndicular, and the rostrum scarcely projecting beyond it [illegible] ly was proportionally slender as compared with the l [illegible] It will be seen that this description exactly correspon [illegible] tain Gray's sketches (figs. 1–5, p. 728). With regard to these [illegible] s it is important to observe that, as they were not drawn to scale, [illegible] bodies appear shorter and stouter than they would if composed [illegible] exact measurements, the reason being that, in any long object when seen from a single point of view, the effects of perspective diminish the length much more than the breadth.

2. Notes on the Characters and Habits of the Bottlenose Whale (*Hyperoodon rostratus*). By David Gray, Commander of the Whaling Steamer 'Eclipse.' (Communicated by Prof. Flower, F.R.S., P.Z.S.)

[Received November 28, 1882.]

These Whales are occasionally met with immediately after leaving the Shetland Isles in March, and north across the ocean until the ice is reached, near the margin of which they are found in greatest numbers; but they are seldom seen amongst it.

Although it is not their nature to keep in amongst the ice, they like to frequent the open bays, for the shelter it gives them from the sea. Sometimes a point of ice overlaps them; it is only then that they are seen going out again towards the ocean. They are also to be met with from the entrance of Hudson's Straits and up Davis Straits, as far as 70° north lat., and down the east side round Cape

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[1] *Loc. cit.* p. 185.

[2] See "Meddelelser om Norges Pattedyrs i Aarene 1876–81," by R.

Farewell, all round Iceland, north along the Greenland ice to 77° north lat.; also along the west coast of Spitzbergen and east to Cherry Island, in lat. 72° north and long. 19° east. Beyond these limits I have never seen them; but doubtless they are to be found as far as the Straits of Belle Isle on the west, and east to Nova Zembla.

From the fact that they are not seen in summer further south than a day's sail from the ice, it would appear that they migrate south in the autumn, and north again in the spring.

They are gregarious in their habits, going in herds of from four to ten. It is rare to see more than the latter number together, although many different herds are frequently in sight at the same time. The adult males very often go by themselves; but young bulls, cows and calves, with an old male as a leader, are sometimes seen together.

They are very unsuspicious, coming close alongside the ship, round about and underneath the boats, until their curiosity is satisfied. The herd never leaves a wounded companion so long as it is alive; but they desert it immediately when dead; and if another can be harpooned before the previous struck one is killed, we often capture the whole herd, frequently taking ten, and on one occasion fifteen, before the hold of them was lost. They come from every point of the compass towards the struck one in the most mysterious manner.

They have great endurance, and are very difficult to kill, seldom taking out less than from three to four hundred fathoms of line; and strong full-grown males will run out seven hundred fathoms, remaining under water for the long period of two hours, coming to the surface again as fresh as if they had never been away; and if they are relieved of the weight by the lines being hauled in off them before they receive a second harpoon and a well-placed lance or two, it often takes hours to kill them. They never die without a hard struggle, lashing the sea white about them, leaping out of the water, striking the boats with their tails, running against them with their heads and sometimes staving the planks in, frequently towing two heavy whale-boats about after them with great rapidity.

They vary in colour from black in the young to light brown in the older animals. The very old turn almost yellow, the beak and front of the head being quite white, with a white band round their necks; all of them are greyish-white in the belly.

Their tails, instead of being notched in the centre as in most other Whales, are round in the middle; and they have great vertical strength in their rump. They can leap many feet out of the water, even having time while in the air to turn round their heads and look about them, taking the water head first, and not falling helplessly into it sideways like the larger Whales.

The full-grown Whale is thirty feet lo
circumference, and yields two tons of
weight of spermaceti. It is remark

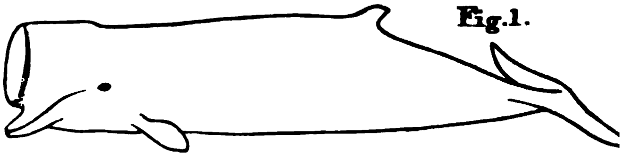

Fig.1.

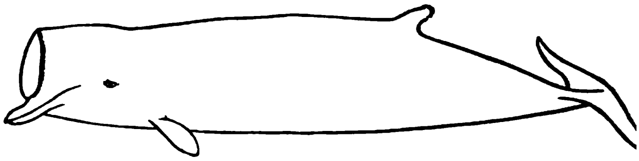

Fig 2.

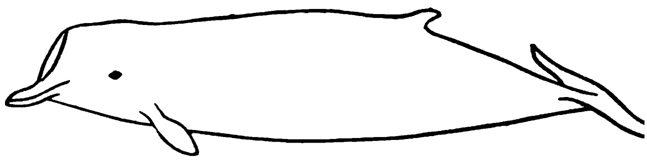

Fig.3.

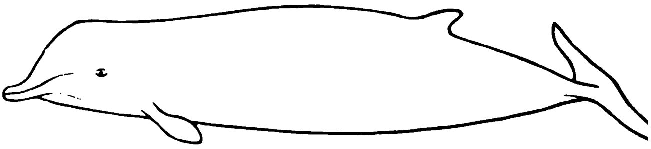

Fig. 4.

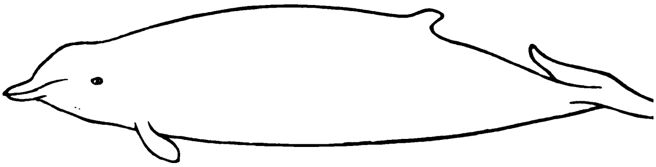

Fig. 5.

Figs. 1–4. Outlines of a series of male Bottlenosed Whales, to show the gressive development of the head from the youngest (fig. 4) t oldest (fig. 1).

Fig. 5. Outline of adult female.

These figures are from sketches by Captain Gray, but are not drawn to s With regard to their proportions see observations on p. 726.

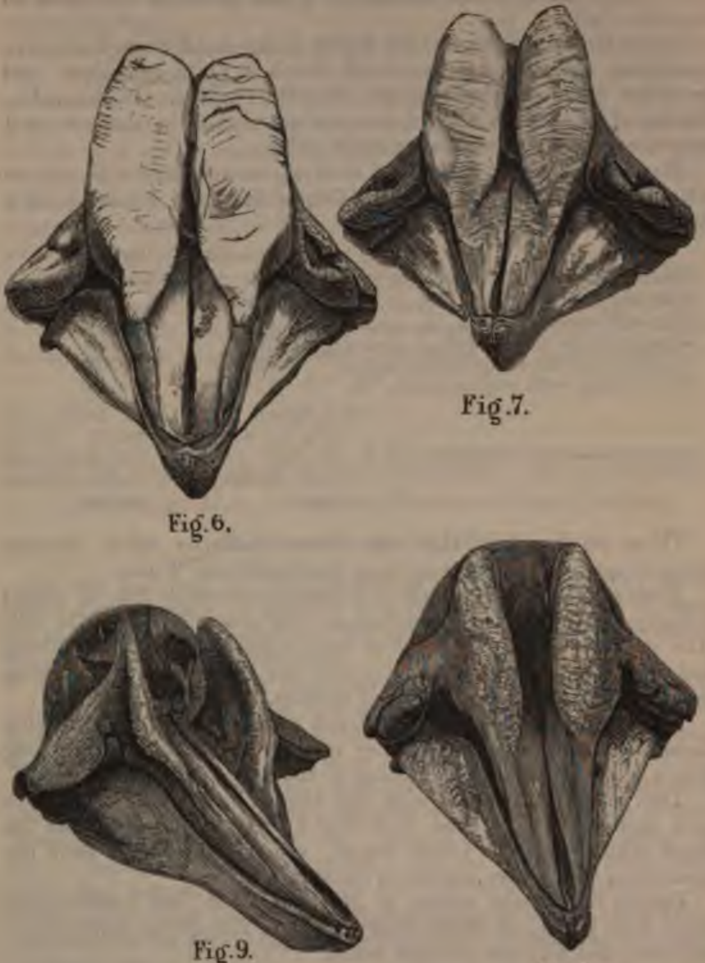

Fig.7.

Fig.6.

Fig.9.

Fig.8.

Front views, from photographs, of the skulls of the four male specimens of which the external characters are given on the opposite page.

Fig. 6. Skull of old male, represented in fig. 1.
Fig. 7. Skull of slightly younger male (fig. 2).
Fig. 8. Skull of still younger male (fig. 3).
Fig. 9. Skull of young male (fig. 4), which both in external form and cranial characters closely resembles the female.

hundredweight of spermaceti to each ton of oil, being exactly the same proportion that the Greenland Whale yields of whalebone to the ton of oil.

In the female, in front of the bones of the head there is a cavity containing a small quantity of oil which is quite colourless and twice the density of that rendered from the blubber. In the males, instead of oil there is a solid lump of fat similar in shape to, and about twice the size of, a large water-melon.

The following is an analysis of their oil, as compared with sperm-oil, prepared by Mr. Alfred H. Allen of Sheffield, Public Analyst for the West Riding of Yorkshire.

	Bottlenose-oil.	Sperm-oil.
Specific gravity at 155° C.	·8763	·8778
Flashing point, ° C.	264	260
Viscosity (seconds)	141	137
Unsaponifiable matter (spermyl alcohol)	39·76	40·50
Sp. gravity of the unsaponifiable matter	·8363	·8307
Rise of temp. with sulphuric acid, ° C.	41	45
Colour-reaction with sulphuric acid	Pale brown, changing on stirring to light violet, and again to brown.	Dark brown, becoming somewhat darker with tinge of violet on stirring.

These results show that the closest similarity exists between genuine sperm-oil and the oil from the Bottlenose Whale.

Their ordinary food consists of a bluish-white cuttle-fish, six inches long by three inches in circumference, and pointed towards the tail. The stomachs of the Whales that were examined contained nothing but their remains; and we never took one alongside without seeing some of them floating out of their mouths.

They evidently have a great depth to go to find them, judging from the length of time that they remain away, and from the long heavy blasts they make on coming to the surface again.

They are much infested with lice about the fins and in patches over their bodies. I send with this a piece of skin cut from the front of the head of a young female, which will serve to show the manner in which they adhere to the skin[1].

During the present season, in May and June, two hundred and three were killed; of these ninety-six were full grown males, fifty-six cows, and fifty-one younger males.

From a cow a young male was cut out, measuring ten feet long by five feet six inches in circumference. The length of the mother was twenty-nine feet.

The heads of two males were measured round the eyes: one was thirteen feet one inch, the other twelve feet six inches, which may be taken as the average size of the circumference of the head of the full-grown male.

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[1] [These agree exactly with *Cyamus thompsoni*, Gosse, Ann. & Mag. Nat. Hist. 2nd ser. vol. xvi. p. 30, pl. iii. fig. 11 (1855), which was found upon the skin of a Hyperoodon captured in Portland Roads on the 2nd of October 1854, as recorded by Mr. W. Thompson (Ann. and Mag. Nat. Hist. vol. xiv. 2nd ser. p. 347. 1854). This is separated generically from the other *Cyami* by Lutken under the name of *Platycyamus* (Christiania Videns. Sellsk. Forhandl. xiii. p. 279, 1871).—W. H. F.]

In the past three seasons I have seen thousands of them; and from constant careful observation while they were in life, and very often close about the ship—also when dead, examining many of their skulls after being taken on board and flenched, the only conclusion that can be come to is, that there is but one species of the Bottlenose Whale inhabiting the Northern seas. There are no flat-headed females. It is only the older males that have the flat perpendicular heads notched back towards the beak, with high crest and close frontal bones.

The accompanying sketches of male Whales (figs 1–5, p. 728), and photographs of their skulls (figs. 6–9, p. 729), will help to show how their heads flatten, and also the progressive manner in which the bones of the head enlarge and close up as they become older.

3. On the Classification of the *Comatulæ*. By P. Herbert Carpenter, M.A., Assistant Master at Eton College.

[Received November 23, 1882.]

In the last part of the Proceedings of this Society Prof. F. J. Bell[1] has proposed "a method of formulating the results attained to, as regards our knowledge of the specific characters of the members" of the family *Comatulidæ*.

That such a method is absolutely necessary for systematic work in a family which comprises so few genera but so many species, was made clear to me before I had been studying the group for many months; and I was therefore in no way surprised to hear that Prof. Bell had arrived at the same conclusion soon after his commencing the examination of the large collection of *Comatulæ* in the British Museum, together with the very remarkable series sent home by Dr. Coppinger, of H.M.S. 'Alert.' I am sorry, however, that Prof. Bell has so soon published his system of formulation; for I cannot but think that a little more experience of the remarkable variations in the group-characters would have caused him to modify it considerably.

I had intended to reserve any publication of the method of formulation which has gradually developed itself during my work on the 'Challenger,' 'Blake,' and other collections, until the appearance of the 'Challenger' Report. But the numerous errors contained in Prof. Bell's paper require an immediate correction, which would be out of place in the 'Challenger' volumes.

Prof. Bell's method is an ingenious one, especially where he joints which become immovably united and behave in all respects as one. But it may be united by syzygy to the second radial, instead of by the usual bifascial articulation[1]. This, however, is of an altogether different morphological value from the syzygial unions of the arm-joints. In the latter case the hypozygal entirely loses its individuality as a separate joint, and bears no pinnule as the episygal and the remaining brachials do. Thus, for example, in very nearly all *Comatulæ* the original third and fourth joints of the growing arm differ from those which ultimately appear beyond them. For "whilst the majority of these gradually come to possess the true articulations, and to be separated by the intervention of muscles and ligaments, a certain small proportion become more intimately united on a simpler plan, which admits of no motion between them"[2]. The double or syzygial joints thus formed resemble the ordinary brachials in bearing but one pinnule, and they are therefore best considered as single joints. In *Ant. rosacea*, for example, the 3rd and 4th, the 9th and 10th, and the 14th and 15th joints of the growing arm are respectively united in pairs by syzygy; but the arm is best described as having syzygies in the 3rd, 8th, and 12th joints. So again in the numerous *Comatulæ*, such as *Act. parvicirra*, which have axillaries on some or all of the primary arms. Counting from the third radial, the distichal axillary is primitively the fourth joint. The first, as is almost invariably the case, bears no pinnule, while the second does bear a pinnule, but the third not; for it is united to the following (axillary) joint by a syzygy. The first ray-division would therefore be described as consisting of three distichal joints, the second bearing a pinnule, and the third (axillary) being a syzygy.

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[1] "An Attempt to apply a Method of Formulation to the Species of the *Comatulidæ*; with the Description of a new Species," P. Z. S. 1882, part iii. pp. 530–536, Pl. XXXV.

In *Encrinus*, in most recent species of *Pentacrinus*, in a few Comatulæ (*Act. solaris*, &c.) the two outer radials and the first two joints beyond them are respectively united by syzygy; and on the principle explained above, each pair would be considered as forming a single joint, so that the true third brachial (itself a syzygial joint) would come to be the second. This would involve our describing these forms as having but two radials, the axillary with a syzygy, and syzygies both in the first and in the second brachials. I think, however, that this would be misleading and make the difference between the two types appear much greater than it really is.

The presence of three radials is such an absolutely constant character in all the five-rayed Neocrinoids, excepting *Metacrinus* & *Plicatocrinus*, that the fact of the two outer ones being united by syzygy and not articulated seems to me to be of minor importance; and I do not assign to it the same morphological value as the syzygial union of the third and fourth primitive brachials, in which the former loses its pinnule. No Crinoid with three radials ever has a pinnule on the second one; and when this becomes the hypozygal of a syzygy, it does not therefore lose its individuality, as is the case with the hypozygals of the brachial syzygies. Almost the same may be said respecting the first two brachials. Most *Comatulæ* have a syzygy in the third brachial with a bifascial articulation between the two preceding joints, the second only of which bears a pinnule. Hence where these two are united by syzygy, as in *Act. solaris*, the first or hypozygal loses no individuality as an arm-joint. They are therefore better described as the first and second brachials, and not as a first brachial which "is a syzygy." This method has the advantage of retaining the third brachial as a syzygial joint as a condition which is common to by far the larger number of *Comatulæ*; for it is only a very few species, like *Act. fimbriata* and *Act. multiradiata*, which have a syzygy in the second brachial and a pinnule on the first. This is an entirely different type, and arises from the coalescence of the primitive second and third joints of the growing arm.

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[1] I use this name to denote the presence of a ligamentous bundle on either side of a vertical articular ridge, while muscles are absent. In by far the greater number of *Comatulæ* this is the mode of union of the two outer radials and of the first two joints beyond each axillary. It also occurs in *Millericrinus*, *Apiocrinus*, *Pentacrinus decorus*, *P. blakei* and other types. But in *Bathycrinus* there is a trifascial articulation, a small additional bundle of fibres being inserted into the apposed faces of the joints at the lower or dorsal end of the articular ridge.

[2] W. B. Carpenter, Phil. Trans. 1866, p. 721.

I cannot, therefore, regard as satisfactory Prof. Bell's formulæ for *Act. solaris*, *Act. brachiolata*, *e. g.* $1.2.\mathrm{A'R}\,\frac{\mathrm{b}}{\mathrm{a}}$ and $1.2.\mathrm{A'R}\,\frac{\mathrm{b}}{\mathrm{b}}$. For the radial axillary is not a syzygy in the same sense as the distichal axillary is in *Act. parvicirra*; neither is the first brachial a syzygy in the same sense as the second or, as I should call it, the third.

I am bound to say, however, that I am in some measure responsible in the matter of the first brachials, having employed this mode of description in my diagnoses of the Leyden *Comatulæ*[1]; but since then I have decided to abandon it, as will be seen from my descriptions of *Act. solaris* and *Act. robusta* of the Hamburg Museum, to to which I have added a few of my reasons for the change[2].

The erroneous character of some of the formulæ given by Prof. Bell is due, I fear, to his not having properly understood the descriptive terminology which I have been led to employ. I have endeavoured, as much as possible, to make it simply an extension of that used by Müller; and I have consequently used the word "rays" in the same sense as Müller did, as I have pointed out above[3]. Prof. Bell, however, seems not only to use it in a different sense himself, but also to have understood me as doing so. The result is that many of the formulæ which he has drawn up on the basis of my descriptions are utterly at variance with them.

The following is an abbreviated extract from the classification of the species of *Actinometra* in the Leyden Museum, together with the formulæ assigned to those species by Prof. Bell:—

A. Second and third radials united by syzygy.

α. Ten arms. .... ***solaris***. $1.2.\mathrm{A'R}^{\mathrm{b}}_{\mathrm{a}}$.

β. Many arms. Rays may divide five times or more. First division of 3 joints, the axillary with a syzygy. Subsequent divisions of two joints united by syzygy.

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[1] Notes from the Leyden Museum, vol. iii. pp. 170–217.

[2] "The Comatulæ of the Hamburg Museum," Journ. Linn. Soc. Zoology, vol. xvi. pp. 514–519.

[3] P. 732, note.

novæ-guineæ. $1(2)A'RDP^{\frac{b}{b}}$.

typica. $1A'RD^{\frac{c}{a}}$.

B. Second and third radials united by ligament.

Many arms. First ray-division of three joints, the axillary with a syzygy.

α. Rays divide three times. Subsequent divisions like the first.

robustipinna. $A'(D)P^{\frac{a}{x}}$.[1]

japonica. $\sqrt{3A'R^{\frac{c}{b}}}$.

parvicirra. $3A'DP^{\frac{(b)}{a}}$.

β. Rays may divide five times or more.

I. Third and fifth ray-divisions like the first. Second and fourth divisions of two joints, the axillary without a syzygy.

alternans. $3A'RPP''^{\frac{c}{a}}$.

II. All ray-divisions like the first.

schlegeli. $3A'RDP^{\frac{ab}{x}}$.

bennetti. $3A'RDP^{\frac{c}{b}}$.

peroni. $3A'RDP^{\frac{b}{b}}$.

Prof. Bell's formulæ do not give any thing like a proper idea of the characters of *Act. novæ-guineæ* and *Act. typica*, especially the latter. Both species are among "those rare cases in which divisions extend beyond the palmars;" and Prof. Bell should therefore have made use of his symbols P' and P''. These two would have sufficed for *A. novæ-guineæ*, which has only two axillaries beyond the palmars. Strictly speaking, however, neither P, P', nor P'' have any proper place in the formula; for the palmar and subsequent axillaries are not syzygial joints homologous with the distichal axillaries, any more than the radial axillary is, either in these two species or in the *solaris* group; and as pointed out above, it is equally incorrect, for morphological reasons, to describe the first brachials as being syzygial joints homologous with the third brachials of *Ant. rosacea* and *Ant. eschrichti*, or with the second brachials of *Act. fimbriata* and *Act. multiradiata*.

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[1] It is absurd to put the D within brackets in this formula, because the onl specimen described has no syzygy in the axillaries of three out of the nin primary arms. I have described a specimen of *Act. parvicirra* in which fiv out of the ten distichal axillaries have no syzygy, and another in which ther are four axillaries with and four without a syzygy. Here therefore we have character which "frequently though not always obtains" just as in *Act. robust pinna.* Why is the one case noted in the formula but not the other? Pro Bell's experience of the variations in these characters must surely have taug him that it is the exception and not the rule for all the distichal and palm series of any many-armed specimen to be exactly alike, and that a specific di gnosis must be based on the characters of the majority. When, however, som specimens of any type have distichals or palmars, and others may be altogeth without them it is useful to put the D or P within brackets; and this shoul have been done in Bell's formula for *Act. parvicirra,* as I shall shortly point ou

In the case of *Act. typica*, the employment of a shorthand has been carried to such an extent by Prof. Bell, that he only makes provision for 20 out of the 80 or more arms that the species possesses. The P which is inserted into the formula for *Act. novæ-guineæ* is here omitted, and only two of the axillaries taken into consideration at all. Nevertheless the rays have been described by myself as dividing seven or eight times; *i. e.* there may be no less than five axillaries beyond the palmars, all united by syzygy to the preceding joints as the palmar axillaries are; while Lovén[1] has figured a specimen with two axillaries beyond the palmars and has described the species as having 80 arms. Prof. Bell's formula, however, $(1\mathrm{A}'\mathrm{RD}^{\underline{o}}_{o})$ takes no account of any palmars at all, much less of any thing beyond them, although Lovén says "*Rami secundi quatuor, bina paria, e brachialibus duobus*," and goes on to speak of *rami tertii*, *quarti*, and *quinti*; but the presence of the D and nothing more in Prof. Bell's formula indicates that the total number of arms is never more than 20 and may be only 11!

It will be evident from the classification detailed above, that the essential character common to all the seven species of group B is the union of the second and third radials by ligaments and not by a syzygy as in the three species of group A. Nevertheless five of the seven formulæ given by Prof. Bell contain an R, which denotes that the radial axillary "is a syzygy." He surely cannot imagine that the radial axillaries which are united by ligament to the second radials are themselves syzygial joints as the distichal axillaries are. I have described the form of the axillaries in each of these five species, but have not said one word about their being syzygial joints. Such a condition, *i. e.* syzygial axillaries united by ligaments to the second radials, occurs in no *Comatula* with which I am acquainted.

Neither are the axillaries united to the second radials by syzygy, as in *Act. solaris* and the other species of Group A, the formulæ for all of which contain an R. It is therefore difficult to understand why the formulæ for five of the species of group B should contain an R which is absent from those of the two remaining species. I can think of no reason for this except that in the diagnoses of these five species I have spoken of the "first ray-division" as consisting of three joints, the axillary with a syzygy. Prof. Bell, who appears to consider the primary number of rays as 10, and not five, as described by Müller and myself, has perhaps understood the term "first ray-division" to mean the five undivided rays themselves, which consist of the first, second, and third (axillary) radials. I had hoped that this expression coming immediately after the statement "the rays (in the Müllerian sense) dividing" 2, 3, or more times, and preceded by the description of the radial axillary where the division occurs, would be interpreted as meaning the ten primary arms which are borne by the axillaries and are themselves conveniently described as consisting of distichal joints. But in order to avoid misconception, I expressly inserted the word distichals in speaking of the first division of the rays of *Act. pulchella*[1]. The description of this species was written before those of the Leyden *Comatulæ*, and must have been read by Prof. Bell, as he gives a formula based upon it.

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[1] Öfv. af. K. Vet.-Akad. Förh. 1866, p. 230.

I cannot help suspecting, however, from the formula which he gives for *Act. alternans*, that he has thus misunderstood my meaning. It is as follows, $3\,A'RPP''\frac{o}{o}$. This can only be interpreted in the following way:—that the radial axillary "is a syzygy" (which is not the case); that there are two distichals[2], the axillary without a syzygy (while there are really three, the axillary with a syzygy); that there are two or three palmars, the axillary with a syzygy (while there are really two, the axillary without a syzygy); and so on for the two remaining divisions, so that the formula should read $3\,A'DP'P'''\frac{o}{o}$. Even then, however, it would not indicate whether two or three distichals are present[3], nor whether there are one or two palmars, nor the number of joints in the two remaining divisions; so that one would be entirely at a loss as to the systematic position of the type.

Prof. Bell gives the formula for *Act. japonica* as $\sqrt{3\,A'R}\,\frac{c}{b}$. Even after the removal of the unnecessary and totally misleading R, the formula is entirely incorrect as regards the ray-divisions, and says nothing about any palmars being present. It means that there are two distichals, the axillary not a syzygy. But in Müller's classification this species is placed in a group distinguished as follows, "Die Axillaria der Arme mit Syzygien;" and my own description runs, "Primary and secondary arms each of three joints, the axillary a syzygy," or, as Prof. Bell puts it, "Three distichals and three palmars, the axillaries syzygies." His formula should therefore be $3\,A'DP\,\frac{c}{b}$.

The formula which he gives for *Act. parvicirra* $\left(3\,A'DP\,\frac{(b)}{a}\right)$ implies that palmars are always present on some of the rays. A specimen has been figured, however, with 13 arms only, having distichals on only three rays and no palmars at all; and others have been noticed with but 18 and 20 arms[4]. The P should therefore be put within brackets, and the formula stand $3\,A'D(P)\,\frac{(b)}{a}$, like that of *Act. wahlbergi*, Müll., and *Act. variabilis*, Bell, MS.

In like manner the formula given for *Act. peroni* $\left(3\,A'RDP\,\frac{b}{b}\right)$ does not convey the information that there may be another axillary beyond the palmars. It should read $3\,A'DP(P')\,{}^{b}_{b}$. There may be yet another in *Act. bennetti* and the number of arms reach 70 or 80, which is only very rarely the case among the *Comatulæ*. Prof. Bell's formula $\left(3\,A'RDP\,\frac{c}{b}\right)$, however, only provides for 40, which is a very common condition. The formula should therefore be $3\,A'DPP'(P'')\,{}^{c}_{b}$. The same may be said of *Act. schlegeli*, the only known example of which has two axillaries beyond the palmars and over 80 arms. Its proper formula would be $3\,A'DPP'P''\,\frac{ab}{x}$, while Prof. Bell gives $3\,A'RDP\,\frac{ab}{x}$, which provides for less than half this number of arms, so that one of the most evident specific characters is not taken into account at all.

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[1] Bull. Mus. Comp. Zool. vol. ix. no. 4, p. 10.

[2] I am at a loss to understand how Prof. Bell can have supposed that the second joint after the radial axillary, which is described as bearing a pinnule, can at the same time be an axillary joint; but no other types without a syzygy in the axillary than a series of two distichals have yet been described.

[3] *I. e.* unless the rule be known that if the distichal axillary is a syzygy it is always the third joint, and not the second, as may sometimes be the case with the palmars.

[4] Trans. Linn. Soc. 2nd series, Zool. vol. ii. 1879, p. 44, and pl. ii. fig. 9.

The ray-divisions of *Act. pulchella* have been thus described:—"10–20 arms, most of the rays usually dividing twice, the first division (distichals) consisting of two joints which are not united by syzygy. When the arms spring directly from the radial axillary, the two lowest brachials are united by ligament, as in most *Comatulæ*, and the third is a syzygial or double joint. But in all the arms which spring from a distichal axillary the two lowest brachials are united by syzygy to form a double joint; and the true third brachial, which is also a syzygial joint, as in all *Comatulæ*, thus becomes the second arm-joint, as in *Act. solaris*"[1]. Two formulæ are necessary for this type—one for the ten-armed form, and another for that with divided primary arms. The first would be $3\,A'^{a}_{b}$, and the second $\sqrt{1.2\,A'^{a}_{b}}$. Prof. Bell, however, writes $(1.2)3\,A'^{a}_{b}$, thus taking no account of the presence of distichal axillaries in some (often all) of the primary arms; and his formula also implies that the first, second, and third brachials of the same arm may all be syzygial joints, which is never the case.

One very serious objection to Prof. Bell's system of shorthand is that (except in one case) it is only applicable to those *Comatulæ* in which the ray-divisions are regular, *i. e.* with the second and subsequent divisions all resembling the first. For regular forms like *Act. parvicirra*, *Act. bennetti*, and their allies, which have three distichals and three palmars with a syzygy in each axillary, Prof. Bell's notation is probably as short a one as could be devised; though it gives no information respecting the number of joints in each series, and does not always indicate whether palmars are present or not. Thus, for example, his formula for *Ant. articulata* is $\sqrt{3\,A\frac{c}{b}}$. This means that distichals are present but do not "present a sygygial joint." It does not indicate, however, whether the axillary is the fourth joint (an actual case in another species), the first (which I have never met with), or the third, or the second (as is really the case). But no information is given at all respecting the presence or absence of palmars or of any further ray-divisions. One finds the same deficiency of information in the formulæ for the following species, viz. *Antedon bimaculata, brevicuneata, elongata, flagellata, lævicirra, macronema, palmata, regina, spinifera.* Had I not examined eight of these personally, I should be unable to classify them properly from Prof. Bell's formulæ alone. The remaining one (*Ant. regina*) is an MS. species of his; and I am therefore unable to give it a place in the classified list of species which concludes this paper.

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[1] Bull. Mus. Comp. Zool. vol. ix. no. 4, p. 10. October 1881. Were I wri now, I should insert the word "nearly" before "all *Comatulæ*" in the sentence.

The only irregular types to which Prof. Bell's notation is at all applicable are those like *Act. rotalaria*, which have two distichals and three palmars, with a syzygy in the last axillary but not in the distichal one. He gives the formula of this species as $3\,\mathrm{X}(\mathrm{P})$; but this tells us nothing as to the number of the distichal joints; and Prof. Bell is unable to carry out his plan of inserting the sign √ to indicate that the distichal axillary is not a syzygy, because it would not apply to the palmars. A specialist would know that there are only two forms of distichal series yet described in *Actinometra*, viz. two joints, the axillary without, and three joints, the axillary with a syzygy; so that the omission of D from Prof. Bell's formula would lead him to infer that only two distichal joints were present in the corresponding species. But Prof. Bell gives no hint of this fact for the benefit of the uninstructed collector; and should an *Actinometra* ever be discovered with four distichals and three palmars (the last axillary a syzygy), instead of two palmars without a syzygy (as is actually the case in one species), it would have the same formula as *Act. rotalaria*, though widely different from it in reality[1].

When, however, the case of *Act. rotalaria* is reversed, and there are three distichals and two palmars, the distichal axillary having a syzygy and the palmar not, Prof. Bell's notation is altogether insufficient. He cannot insert a P. because there is no syzygy in the palmar axillary; and he cannot use the sign √, because there is a syzygy in the distichal axillary. He is therefore obliged to content himself with making no mention of any palmars at all. Omitting the cirrus-characters, we find his formulæ for the six following species to be all of the same general type, viz. 3 A (or A′) D. The species are—*Antedon briareus, A. decipiens, A. irregularis,* and *A. savignii, Actinometra trichoptera* and *A. multifida*. All of them have three distichals with the axillary a syzygy; but some of them, *Ant. savignii* and *Act. multifida*, also have two palmars, while others, like *Act. trichoptera*, have not. Prof. Bell, however, gives the same group-formula in each case, so that I am unable to refer his two species, *Ant. decipiens* and *Ant. briareus*, to their proper positions; and I have only been able to place *Ant. irregularis* in my classified list, owing to his having kindly permitted me to examine it for myself. Both *Ant. decipiens* $\left(3\mathrm{AD}^{\mathrm{b}}_{\mathrm{b}}\right)$ and *Ant.*

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[1] I am here speaking only of the ray-divisions, and take no account of the characters of the cirri, which might or might not be different in the two species.

briareus $(3\mathrm{AD}^{\mathrm{b}}_{\mathrm{a}})$ have the same formula, except as regards the number of joints in the cirri; but, for all I know, the one may have 20 arms only and the other 40, 60, or more. *Act. multifida* is a many-armed form of this kind, having two joints in the palmar and subsequent ray-divisions. Müller describes the number of arms as 40–44, and I have seen individuals with even more; but Prof. Bell gives the species-formula as $3\,\mathrm{A'D}^{\mathrm{b}}_{\mathrm{a}}$, *exactly* the same as that of *Act. trichoptera*, which has no palmars and 20 arms or less!

I cannot imagine what has led Prof. Bell to suppose that the radial axillary of *Act. multiradiata* "is a syzygy," so that he has inserted an R into his formula. Müller made no mention of it in his description of the type, as he did in the case of *Act. solaris* and its allies; and in a memoir[1] now three years old, after personally examining the type specimens at Paris, I placed the species in a group distinguished as follows—"Second and third radials united by ligament only." Surely Prof. Bell has not understood Müller's expression, "Die axillaria der *Arme* mit Syzygien," to include the *radial* axillary also[2]. With this R omitted and a missing (P') inserted, the formula becomes $2\,\mathrm{A'DP(P')}^{\mathrm{b}}_{\mathrm{b}}$; but it gives no information whatever respecting the number of joints in the distichal and palmar series. When the distichal axillary "is a syzygy," it is either united by syzygy to the preceding joint (*Act. jukesi*), or there are two joints below it, so that it is really the third distichal. This rule is an invariable one; but even supposing it to be known to the readers of Prof. Bell's formulæ, the same does not hold good with the palmars. For the palmar axillary, which "is a syzygy," may be the third of its series, as in *Act. parvicirra* and *Act. bennetti*, or the second, as in *Act. multiradiata*; or, like the distichal axillary of *Act. jukesi*, it is syzygially united to the preceding joint, as in *Act. typica*. Prof. Bell's formula, however, gives no information about this, and the special distinctive character of the *multiradiata* group is thus altogether lost sight of, unless No. 5 of the following Rules be understood as known; but Prof. Bell is silent upon this point.

The weakness of his method of formulation is partly due to the following cause:—The same symbol (D or P) is used indifferently, whether there are three or two joints, the axillary with a syzygy, or two joints united by syzygy. I should say, however, that the figure indicating the position of the first brachial syzygy would in most cases explain to an experienced worker which type was meant, as is shown in the general rules stated below; but Prof. Bell gives no hint of this.

The formula 3DP, which he gives for *Act. parvicirra*, would thus admit of any of the nine following explanations, the third brachial being a syzygy in all cases, and the two outer radials united by ligament. In the other two columns are recorded some existing species, the distichal and palmar axillaries of which are syzygies,

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[1] Trans. Linn. Soc. 2nd ser., Zool. vol. ii. p. 27.

[2] The italics are mine.

[illegible]

Group.	[illegible]	[illegible]	[illegible]
I.	[illegible]	[illegible]	
	[illegible]		[illegible]
	[illegible]		
II.	[illegible]		
	[illegible]		
	[illegible]		
III.	[illegible]		
	[illegible]		

Now, unless Rule 3 were known, how should any one [illegible] formula for *Act. parvicirra* ([illegible]), or [illegible] *radiata* ([illegible]), know that he could only [illegible] types belonging to one of the first two groups? And unl[illegible] acquainted with Rule 7, he would not know that Grou[illegible] a series of types that are as yet undiscovered. But [illegible] the chances of error would be two to one unless Rule [illegible] according to which the third (or second) brachial is [illegible] when there are three (or two) palmars, the axillary [illegible] There may, however, be two palmars with the axil[illegible] and yet the first two brachials be united by syzygy, [illegible] of the scheme above. This exception, to which others [illegible] soon be added, also shows the weakness of Prof. Bell's [illegible] supposing the following rules to be understood; [illegible] would be 1DP, identical with that of another more [illegible] B of the above scheme, to say nothing of half a doz[illegible] bilities in Groups II. and III.

A working method of formulation, therefore, m[illegible] enough to deal with such anomalies as A, and in[illegible] on what joint the syzygy comes in the distichals, [illegible] brachials. *Further*, when there are no syzygies [illegible] divisions, whether throughout them all (*Act. palmat*[illegible] only (*Act. alternans*), the number of joints in each d[illegible] be clearly indicated. Thus the formula 3 A'D, as [illegible] Prof. Bell, would stand for any one of the following [illegible] of *Actinometra*, apart from any number of possibilities

Act. trichoptera...	No palmars.	Al
α.	1 palmar (axillary).	
β.	1 palmar, and 1 axillary beyond it.	
γ.	2 palmars.	
Act. multifida ...	2 palmars, and another similar division.	

The want of elasticity which renders Prof. Bell's system so misleading will not be found, I hope, in that which I am now about to explain. It has grown up gradually during seven years' work, and will meet all the variations of actual *Comatula*-structure with which I am acquainted, together with any others that I can imagine as possible. Some time ago I pointed out that "the first and second segments beyond every axillary, whether radial or brachial, are nearly always united together in the same manner as the second and third (axillary) radials." Further experience has shown that the "nearly" embraces several well-marked but regular exceptions to the above statement; and I have therefore drawn up the following rules, which embody the results of my study of the group. They are not to be in any way regarded as *laws* of *Comatula*-structure, but merely as generalizations based upon a knowledge of some 400 species, and therefore, I hope, of some value for the purpose of classification.

1. All ten-armed species of *Actinometra* which have the two outer radials united by syzygy, have the first two brachials united in the same way.

Ex. *Act. solaris.* No *Antedon* known.

2. All many-armed species of *Actinometra* which have the outer radials united by syzygy either have (α) all the ray-divisions of two joints also united by syzygy and the first two brachials similarly united; or (β) there may be three distichals, of which the first two are articulated and the axillary is a syzygy, while the subsequent divisions are as above.

Ex. *a. Act. jukesi*; *β. Act. typica.*

3. If the two outer radials are united by a ligamentous articution, the next two joints are similarly united, whether there be ten or many arms. In the former case the third brachial is almost always a syzygy. (One of the "Blake" *Comatulæ* is an exception.)

Ex. *Ant. rosacea, Ant. philiberti, Act. meridionalis, Act. parvicirra.*

4. In by far the greater number of *Comatulæ* which have the two outer radials articulated by ligaments and only two ray-divisions, the third brachial is the lowest syzygial joint on the arms, whether the distichal axillary be a syzygy or not; and the two lowest brachials are articulated by ligaments.

Ex. *Ant. macronema, Ant. reynaudi, Act. trichoptera.*

Exceptions. *Act. fimbriata* and *Act. borneensis*, with some undescribed *Antedon*-species, have the second brachial a syzygy, like the distichal axillary. *Act. pulchella* and a new 'Challenger' *Antedon* have two distichals the axillary not a syzygy, but the first two brachials united by syzygy.

5. If the two outer radials are articulated and there are more than two ray-divisions, so that palmars are present, the third brachial is the first arm-syzygy in all cases but the following:—

a. Two palmars united by syzygy; the first two joints beyond the palmar and all subsequent axillaries are also united syzygy.

I subjoin the formulæ for all the variations of structure that have met with among the *Comatulæ*, together with the names nearly all the described species to which the respective formul apply. Grube's two species, *C. lævissima* and *C. mertensi*, a referred by Prof. Bell to *Antedon*, and probably correctly so; bu two other species in his *Antedon*-list have no existence, viz. *alat* and *meridionalis*. The former is identical with the *Antedon pulchella* of Pourtalès and was referred to *Actinometra* in 1881, while the latter also belongs to this genus[1]. Some of Prof. Bell's MS. specie are also omitted, owing to the incompleteness of the formulæ which he gives for them.

LISTS OF FORMULÆ.

Antedon.

I.	A. R.3.	
	A. R.3.2.2.	
	A. R.3.3.	
II.	A. 10.[2]	*adeonæ, antarctica, armata, brevipinna, carinata, celtica, cubensis, dentata*[3], *dubeni, eschrichti, hageni, insignis, jacquinoti, lovéni, milberti, milleri, lævipinna, perspinosa, petasus, phalangium, pinniformis, prolixa, rosacea, rubiginosa, serripinna.*
III.	A. 2. $\frac{b}{2}$.	
	A. 2.	*brevipinna, macronema.*
	A. 2.2.	*æquipinna, articulata, bimaculata, brevicuneata, elongata, flagellata, imparipinna, indica, lævicirra, palmata, protecta, spicata, spinifera.*
	A. 2.2.2.	*palmata.*
IV.	A. 3 $\frac{b}{2}$.	
	A. 3.	*briareus, decipiens, elegans, reynaudi*[4], *rubiginosa.*
	A. 3.1.	
	A. 3. $\frac{p.b}{2}$.	
	A. 3.2.	*acuticirra, crenulata, granulifera, irregularis, ludovici, savignii, variipinna.*
	A. 3.2.3.	

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[1] See Bull. Mus. Comp. Zool. vol. ix. no. 4, 1881, pp. 6, 9.

[2] In cases like this, when there are a large number of species in any given group, some further mode of classification becomes necessary; and the notation proposed by Prof. Bell for the varying characters of the cirri is very useful for this purpose.

[3] This species is undoubtedly identical with the *Ant. sarsii* of Düben and Koren; and as Say's name is the older by nearly twenty years, I feel that it is only right to follow Prof. Verrill in restoring it.

[4] The formula given by Prof. Bell for this species is based on Müller's description, which is incorrect. It should be 3 AD $\frac{b}{c}$.

	A. 3.2{p.b.}.	
	A. 3.3.	*bipartipinna, elegans, microdiscus, philiberti.*
	A. 3.3.3.	
V.	A. 4.	

Actinometra.

I.	a. R. $10\frac{b}{2}$.	*affinis, albonotata, pectinata, purpurea, robusta, rosea, solaris.*
II.	a. R. $\frac{d.b}{2}$.	*jukesi, paucicirra?*
	a. R. $3\,\frac{p.p'.p''.b}{2}$.	*novæ-guineæ, typica.*
III.	a. 10. 2b.	
	a. 10.	*coppingeri, cumingi, echinoptera, meridionalis, pulchella.*
IV.	a. $\frac{d.p.p'b}{2}$.	
	a. 2. $\frac{b}{2}$.	*pulchella.*
	a. 2.	
	a. 2.2.	*stelligera.*
	a. 2.2.2.	
	a. 2.2.2.2.	
	a. 2.3.	*rotalaria.*
	a. 2.3.3.	
	a. 2.3.3.3.	
V.	a. 3. $\frac{b}{2}$.	
	a. 3. 2b.	*borneensis?, coccodistoma, fimbriata.*
	a. 3.	*parvicirra, trichoptera, variabilis, wahlbergi.*
	a. 3.1.	
	a. 3.1.1.	
	a. 3.$\frac{p.b.}{2}$.	*B.*
	a. 3.2.	
	a. 3.2.2.	*multifida.*
	a. 3.2.3.	*grandicalyx.*
	a. 3.2.3.2.	*alternans.*
	a. 3.$\frac{2}{3}\left(\frac{o}{i}\right)^1$ 2.2.	
	a. 3. $\frac{2}{3}\left(\frac{o}{i}\right)^1$ 3.3.	
	a. 3. 2p.$\frac{b}{2}$	*A.*
	a. 3.2{p.b}.	*lineata.*
	a. 3.2{p.p'.b}.	*multiradiata.*
	a. 3.3.	*annulata, japonica, meyeri, parvicirra, robustipinna, variabilis, wahlbergi.*
	a. 3.3.2.	
	a. 3.3.3.	*bennetti, peroni.*
	a. 3.3.3.3.	*bennetti, schlegeli.*
VI.	a. 4.2.2.2.2·2.	

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two outer palmar series on each ray are formed of two joints only, syzygy; while the two inner series consist of three joints,

4. On the Identity of *Arnoglossus lophotes*, Günther, with *A. grohmanni*. By Francis Day, F.Z.S.

[Received November 6, 1882.]

(Plate LIII.)

In the issue of 'Nature' for October 5th (vol. xxvi. p. 556) will be found a notice that Professor Moseley had obtained off Cardiff a specimen of *Arnoglossus lophotes*, Günther, hitherto known only from two dried skins in the Couch collection, the locality of which was uncertain. This specimen was said to establish the validity of Dr. Günther's classification of this fish as a distinct British species.

The article being unsigned, I have no means of ascertaining who the author of this interesting statement may be; and while expressing my individual satisfaction that Professor Moseley has clearly obtained a pleuronectoid fish hitherto not recorded from the British seas, I would beg leave to draw attention to a few errors in the article. First, there are three, not two, skins of *Arnoglossus lophotes*, Günther, in the British Museum; secondly, they came from *Yarrell's*, not from Couch's collection; while, as no doubt can exist of the identity of these skins with Professor Moseley's specimen, I propose to show that *Arnoglossus lophotes*, Günther, is a synonym of *Arnoglossus grohmanni*, Bonaparte.

As, when writing the portion of my 'British Fishes' which contains the pleuronectoids, I had to investigate the question of the skins in the British Museum, and whether on such grounds I could recognize *Arnoglossus lophotes* as a British species, it may be interesting to explain why I was unable to do so. This conclusion I still believe to have been sound; for I was under the impression that the specimens did not constitute a new species, but were identical with the Mediterranean *Arnoglossus grohmanni*, from which locality I also believed they had been obtained.

The references to this fish are as follows:—

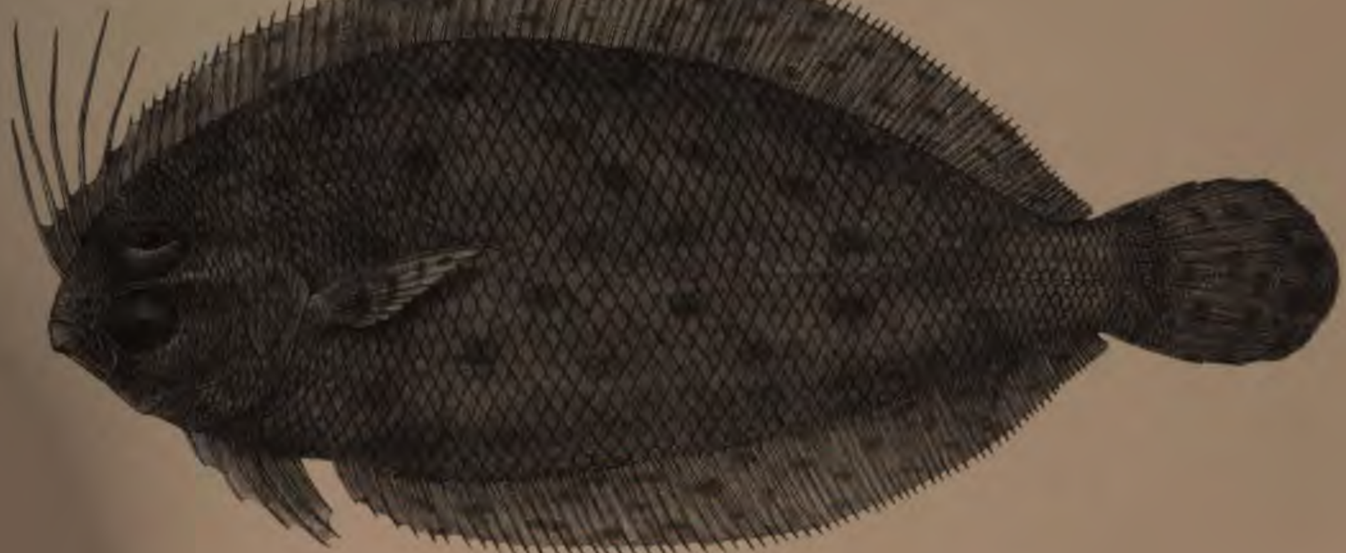
ARNOGLOSSUS GROHMANNI. (Plate LIII.)

Pleuronectes grohmanni, Bonap. Cat. Met. p. 47, no. 401; Fauna Ital., Pesc. tav. 98. fig. 2: Canestrini, Arch. per la Zool. i. p. 12, t. 1. f. 3 (58 scales along the lateral line); Moreau, Poiss. France, iii. p. 326, fig. 185.

Arnoglossus grohmanni, Günther, Catal. iv. p. 417; Giglioli, Catal. Pesc. italiani, p. 38, no. 315.

Arnoglossus lophotes, Günther, Catal. iv. p. 417; Couch, Fish Brit. Isles, iii. p. 178 c. fig. (with abnormal curve to the lateral line).

In the 'Catalogue of the Fishes of the British Museum,' iv. p. 417, Dr. Günther makes Canestrini's fish the same as Bonaparte's. His figure and description agree with Mediterranean specimens which I exhibit, received from Prof. Giglioli of Florence, which are identical with Prof. Moseley's fish. In the 'Catalogue,' *l. c.* pp. 417–418,



Mintern Bros. imp.

ARNOGLOSSUS GROHMANNI.

in the Lemon Sole—clearly indicating that such a variation
is well within such as is normally perceived in Europe
which visit the British coast. This deviation in the numb
is consequently an insufficient reason for constituting *A.*
species; and it must be regarded as a synonym of *A. g*
which can now be recorded among the wanderers to our s

I now come to the consideration of the statement that t
example "establishes the validity of Dr. Günther's classif
this fish (*Lophotes arnoglossus*) as a distinct British speci

I have only seen Dr. Günther's remarks that "it is not
probable that these three specimens (skins from Yarrell's
really are British" (Cat. iv. p. 418); but in his 'Intro
the Study of Fish,' p. 556, 1880, he merely places one spec
genus, *Arnoglossus laterna*, as extending to the south
England.

After Dr. Günther had recorded the skins as forming
species, Couch was, I believe, the first and the last au
admitted *Arnoglossus lophotes*, Günther, to be a British f
gives as his reason that "these same examples [the three s
examined by myself at Mr. Yarrell's house, at which time
note of its being that gentleman's opinion that they forme
or monstrosities of the Megrim or Scaldfish (*Arnoglossus*
but that they appeared to me to differ considerably f
examples of the last named" &c. (Fish Brit. Isles, iii. p. 1
says that he "judged them to be a species new to Britain;
whence they were procured did not appear." Couch
that he had seen an example of the same species among a
made by Lieutenant Spence, of the Royal Navy, at P
and it was on this supposition that he introduced it into h

The only doubt is, whence Yarrell's skins which formed t
Arnoglossus lophotes were derived. In the last edition of
vol. i. p. 645, he records the possession of a Mediterranean s
the Megrim, *Arnoglossus laterna*, and tells us that the late
its commencement rises higher than in his figure of the B
grim. I think that this will account for one example of the
in the national collection, which has the curved portion of
line abnormally elevated, as shown in Couch's figure. B
specimen is one of three of certainly the same species, a
types of *A. lophotes*, Günther, I think we are justified in
that all may be Mediterranean specimens, especially as w
evidence whatever of their being British. This would le
inference that they would probably be Mediterranean speci
certainly the example obtained at Cardiff gives us every
suppose that it is *A. grohmanni*, identical with the types of
Günther.

The figure (Plate LIII.) is taken (natural size) from t
of this fish obtained by Prof. Moseley in the British Ch
now in the British Museum. It therefore represents an u
ably British specimen of *Arnoglossus grohmanni*.

5. On Hybrids between Salmon and Trout.

By F. Day, F.Z.S.

[Received December 7, 1882.]

The hybridism of fishes is a question of very great interest to the zoologist and importance to the pisciculturist, but which, for obvious reasons, is difficult to investigate, it being only those who possess large stock-ponds or peculiarly adapted waters that are able to assist inquirers in this direction or personally afford the desired information.

Among the Salmonidæ hybrids have frequently been adverted to as occurring in a state of nature, as well as due to the manipulations of pisciculturists. Fitzinger informs us that *Salmo schiffermuelleri* must be considered a cross between a Trout and a Charr, and that in the young the reproductive organs merely exist in a rudimentary condition, while they degenerate into adipose tissue in the adult.

At Sir J. Gibson-Maitland's magnificent piscicultural establishment at Howietoun near Stirling some experiments on this subject have been made, at first under the impression that all our freshwater forms of Trout were distinct species; while others are now in progress, the results of which will be watched with great interest.

November 25th, 1879, a man arrived at Howietoun with some salmon-milt obtained the previous night; and this was employed for the purpose of fertilizing some eggs from a four-year-old Lochleven Trout. A few of the progeny were successfully reared; and one of the last examples was captured in the stock-ponds in my presence, November 14th, 1882. It was given me by the owner, and is now on the table. The age of the fish is consequently about 2 years and 9 months, being in fact a grilse in good condition and 11 inches in length.

B. x. D. 12 $(\frac{3}{9})$. P. 12–13. V. 9. A. 11 $(\frac{3}{8})$. C. 19.
L. l. 118. L. tr. 25/30. Cæc. pyl. 62.

	inches.
Total length of specimen	11·0
Length of head	2·4
Length of pectoral fin	1·7
Distance from snout to base of dorsal fin	4·5
Distance to centre of base of caudal	9·8
Diameter of eye	0·4
Distance of eye from end of snout	0·7
Distance apart	0·8
Height of body	2·5

Preopercle forming an almost regular curve, with but very slight appearance of a lower limb. Lower jaw with a slight hook at its extremity. A line taken from the snout to the furthest point of the posterior edge of the opercle passes through the lower third of the eye. Teeth in a double row along the body of the vomer. *Scales*: 12 rows passing downwards and forwards from the hind edge of the adipose dorsal fin to the lateral line; 25 rows of the longest outer one. The maxilla extends posteriorly to beneath the posterior third of the eye. The preopercle has a distinctly oblique lower limb, which in this example is less strongly marked than in No. 2, while merely a simple curve exists in Nos. 3 and 4.

The central caudal ray is half the length of the longest outer one in examples 1 and 2, but two thirds in Nos. 3 and 4. Respecting the cæcal appendages, Nos. 3 and 4 were first immersed in a weak solution of chromic acid, which has hardened them, facilitating their being counted. No. 3 contained 78, and No. 4 had 61; the other two were not examined. If hybrids between the Lochleven Trout and a male Salmon show such variations, it demonstrates the inconstancy of the number of these appendages. We took two Lochleven Trout, each similar in appearance, and about 8 inches in length, which had been bred at Howietoun from eggs and milt of fish inhabiting the stock-ponds, and were consequently one generation removed from Lochleven parentage; in one they were short and 40 in number, in the other rather long and 67. (The preparations are on the table.)

Respecting the scales, from 120 to 121 rows descend from the back to the lateral line. In Nos. 1, 3, and 4 there are 13 passing downwards and forwards from the hind edge of the base of the adipose dorsal fin to the lateral line, while in No. 2 there are 12.

Colours. These are nearly identical in all four; from 12 to 13 lateral parr bands pass down the sides, which are also more or less closely sprinkled with small black spots and some few red ones; there are also black spots on the gill-covers and on the upper surface of the head. A very remarkable feature common to all is that the dorsal fin has its front upper edge white, with a black intramarginal band, and from 11 to 13 black spots on or between the rays. Attention may here be directed to no white upper edging existing on the dorsal fin in any of the Lochleven variety of Trout at Howietoun, such a mode of colour being restricted to the burn-trout variety at that establishment; and this forms another link in the chain of facts that these two forms are merely varieties of one species.

I wish here to record some experiments commenced on November 15th by Sir J. Gibson-Maitland, while I and others were present.

About 3000 ova were obtained from Lochleven Trout, and fertilized with the milt of the American Charr, *Salmo fontinalis*. They were placed in hatching-box No. 108.

About 8000 ova of the American Charr were milted from Lochleven Trout, and placed in hatching-box No. 104.

About 9000 ova of the American Charr were fertilized with the milt of a Scotch Charr which has been termed *Salmo struanensis*, and placed in hatching-box No. 115.

In Austria, observes Peyrer, the Charr (*Salmo salvelinus*) is crossed with the Trout; and the young excel the pure breed in many respects. Whether this is partly due to their being sterile, and consequently not going out of season subsequently to the breeding-season, is not mentioned. The life-history of these true hybrids cannot but be interesting; and such in due time will doubtless be forthcoming from Howietoun.

6. On some Rhopalocera from New Ireland.

By F. D. Godman and O. Salvin.

[Received November 20, 1882.]

Some few months ago we received another small consignment of Butterflies from the Rev. George Brown, containing a few fine examples of *Ornithoptera d'urvilliana* and some other good insects from New Ireland and New Britain; there was, however, but one novelty in the collection. About the same time we received a small set of insects from Mr. E. L. Layard, most of which were from New Ireland; amongst these was a second specimen of the *Prothoe* already sent by Mr. Brown and of a *Danais* which is likewise new.

Euplœa unibrunnea, Godm. & Salv. P. Z. S. 1877, p. 141.

In the P. Z. S. for 1879 we mentioned that we had received a female specimen of this species, sent us by Mr. Brown from New Ireland, which differed very slightly from the male. A second example from the same locality has now reached us, forwarded by Mr. E. L. Layard. As this specimen differs considerably in its markings from the one first received, it calls for some further notice. The whole of the interior of the cell on the upper surface of the primaries and the discal spaces between the nervules is buff instead of palish brown; and the white spots of the underside are distinctly seen above. The secondaries are likewise buff towards the anterior angle and inner margin, and a well defined double submarginal row of whitish spots is visible; also the spots at the end of the cell are indicated. The upper surface in the first specimen is of a nearly uniform pale brown, the cell of the primaries alone showing a slight tinge of buff, and the spots of the underside are not visible above. This second example is of considerable interest, as it approaches in its coloration the remarkable *Euplœa browni* from New Britain, thereby showing its close relationship to it. One of our own male insects also has a dash of buff within the cell of the primaries, which does not exist in any of the others.

Prothoe layardi, sp. nov.

Exp. 4·3 inches.

Alis nigris, anticis maculis quatuor elongatis subapicalibus, aliis duabus minutis infra eas, posticis subcaudatis macula subrotunda aream discalem occupante; omnibus sulphureis, subtus dilutioribus, anticis maculis paginæ superioris aliisque minutis in cellula, posticis lineis tribus submarginalibus fractis violaceis, punctis ad basin albis, maculis binis angulum analem versus flavis notatis.

Hab. New Ireland.

We have received two male examples of this fine insect—one sent us by Mr. Brown, the other by Mr. Layard. It appears to be most nearly related to *P. australis* of Guérin, described and figured in the 'Voyage of the Coquille.' It differs, however, from this in having but one row of spots towards the apex of the primaries, the secondaries more caudate, and the sulphurous spot on the discal area larger.

DANAIS ADUSTUS, sp. nov.

Exp. 2·7 inches.

Alis rufo-fuscis, macula ultra cellulæ finem elongata, punctis duobus supra eam, apicem versus tribus minutissimis serieque submarginali albis; posticis macula duplici elongata ultra cellulam serieque duplici punctorum submarginalium coloris ejusdem: subtus ut supra, sed maculis omnibus majoribus aliisque ad cellulæ finem posticarum positis.

Hab. New Ireland.

This species is allied to *Danais mytilene* of Felder from New Guinea, and belongs to a small group all the members of which are of a uniform reddish-brown colour on the upper surface, marked with a few white spots. Mr. Butler has recently described two species which are closely allied, one from the Solomon, the other from the Duke-of-York Islands; but both differ considerably from the present species in the arrangement of the white spots, as will be seen by a reference to the description above. The specimen from which this description is taken is a male, and was sent us by Mr. E. L. Layard. Though in but poor condition, we have not hesitated to name it.

7. Description of two new Species of *Pteropus* from the Caroline Islands. By OLDFIELD THOMAS, F.Z.S., British Museum.

[Received December 2, 1882.]

(Plates LIV., LV.)

Up to the present time no species of *Pteropus* have been recorded from the Caroline Islands, with the exception of the large and widely distributed *Pt. keraudreni*, Q. & G.; so that it was with much interest that I found several small Flyingfoxes in a collection recently obtained from the Godeffroy Museum, and formed for that Institution by Dr. Kubary.

In all there were five specimens, two from Mortlock Island and three from Ponapé. These five belong to two species, both new, of the first of which there is only a single specimen from Mortlock I., while the other is represented by the second Mortlock specimen and the three from Ponapé. Both species are remarkable for the comparative weakness of their dentition, a character no doubt resulting from the soft nature of some Caroline-Island fruit upon which they feed.

Pteropus phæocephalus, sp. n. (Plate LIV.)

Face and chin dark blackish brown, crown of head somew lighter; dorsal side of neck, and back, chestnut-brown, the tip the hairs nearly white; shoulders and sides of neck very pale yellov white, forming well-marked shoulder-patches; the bases of the h brown; below neck very light brown. Chest with a conspicu patch of yellowish white on its centre; rest of underside and fu the interfemoral membrane and wings dark rufous-brown. Tip the hairs throughout, and especially on the head and neck, wit very noticeable silvery lustre.

Above, the fur is nearly two inches in breadth across the b and extends thinly half along the humerus, while the forearm is q naked. Below, it grows on the wing-membrane as far as a drawn from the elbow to the knee, and there is a distinct patcl longish hairs behind the proximal third of the forearm. In femoral thickly covered above for half its breadth, nearly na below.

Ears narrow, slightly longer than the muzzle, inner margin eve convex, tip narrowly rounded off, outer margin straight in its up convex in its middle, and straight in its lower third. Wings ari from within half an inch of each other on the back. Interfem very narrow, almost obsolete in the centre.

Teeth (Plate LIV.) on the whole very small and weak. nines, both above and below, with unusually broad postero-inte basal ledges. First upper premolar minute or deciduous, w present standing in the tooth-row; second premolar and first m scarcely longer than broad, second molar regularly oval; last m subtriangular, rather smaller than the first lower premolar, larger than the last lower molar, which is about equal to one of outer upper incisors. Below, the inner incisors are about half size of the outer; first premolar large, filling up the space betw the canine and second premolar; second and third premolars first molar with small postero-external basal cusps.

Dimensions of the type, a gravid female in alcohol, from Mort Island:—

Head and body 6 inches; head 1·95; nose to eye 0·7; nose to 1·55; ear-conch, length ·86, breadth ·43; forearm 4·0; th 1·6; 2nd finger 2·75; 3rd finger—metacarpal 2·65, 1st phalanx 1 2nd phalanx 2·75; 5th finger—metacarpal 2·75, 1st phalanx 1·2, phalanx 1·25; tibia 1·9; calcaneum 0·4; foot 1·25.

This brightly marked species seems to be most nearly allie *Pt. temmincki*, Peters, from Amboina and Ceram; from wh however, it differs in its brown instead of yellow head, in its sho muzzle, rounder molars, much larger first lower premolars, in the broader postero-internal ledges to the canines.

Pteropus breviceps, sp. n. (Plate LV.)

Colour throughout uniform dark rufous-brown, the short hai the muzzle and between the eyes silvery yellow. Fur soft woolly; above, it grows thinly along the humerus and half the forearm, and thickly over the whole of the interfemoral membrane, and down the tibiæ nearly to the ankles. Beneath, the proximal halves of the humeri are covered; there are a few hairs behind the elbow and on the proximal third of the interfemoral. The fur along the back is nearly two inches in breadth.

Ears very short and almost buried in the fur, both edges evenly convex, the outer more strongly so than the inner; tip sharply pointed. Wings arising within half an inch of each other on the back. Interfemoral membrane very narrow in the centre, quite hidden by the fur.

Teeth (Plate LV.) smaller even than in *Pt. phæocephalus*. Canines with much narrower postero-internal ledges. Above, the first premolar is either absent, or, if present, stands quite outside the tooth-row; last molar about the same size as one of the outer incisors. Below, the first premolar is slightly larger than the penultimate molar, the latter, like the other molars, being remarkably small. Last molar about equal to one of the outer incisors.

The following are the dimensions of three specimens of this species. The first is the specimen described; the other two, however, only differ from it in being of a somewhat darker colour throughout and in having slightly longer ears.

	a.	*b.*	*c.*
	Mortlock I.	Ponapé.	
	♀ (type).	♂	♀
	in.	in.	in.
Head and body	5·3	5·25	5·4
Head	1·75	1·65	1·65
Nose to eye............	·64	·62	·65
Nose to ear............	1·35	1·35	1·36
Ear-conch, length	·57	·64	·61
Ear-conch, breadth......	·29	·35	·31
Forearm	3·55	3·6	3·75
Thumb	1·45	1·45	1·46
2nd finger	2·6	2·45	2·55
3rd finger, metacarpal....	2·35	2·3	2·4
„ 1st phalanx ..	1·75	1·7	1·78
„ 2nd phalanx ..	2·75	2·55	2·7
5th finger, metacarpal ..	2·5	2·5	2·6
„ 1st phalanx ..	1·1	1·15	1·17
„ 2nd phalanx ..	1·3	1·15	1·25
Tibia	1·75	1·73	1·8
Calcaneum	·4	·38	·4
Foot	1·15	1·2	1·2

This species may be readily recognized by its small size, short head, and remarkably small rounded molars, in which latter character it by far exceeds any other *Pteropus* known, with the exception of *Pt. scapulatus*, Ptrs., an otherwise wholly different form.

8. Notes on Asiatic Butterflies, with Descriptions of new Species. By Major G. F. L. Marshall, F.Z.S.

[Received December 4, 1882.]

AMECERA MENAVA.

A single female specimen has recently been taken by Col. A Lang, R.E., in the Kawas valley, in Beluchistan, at 8000 fee vation. This species is new to the Beluchistan fauna; and evident from this capture that the range of the species is much than has hitherto been believed. It is a very local insect, and not appear to be common anywhere.

HIPPARCHIA PIMPLA.

A single male specimen which is apparently referable to species was taken by Col. A. M. Lang, R.E., on a rocky mou top, at 8500 feet elevation, near the Kawas valley, in Beluch It differs from a female specimen, taken by Major John Bid on the Shandur plateau, in North-west Kashmir, on the upp in its uniform dark brown colour and the absence of fulvous ings on the fore wing; and on the underside in its generally d tone and better-defined markings, and the much more rest area of the fulvous patch on the fore wing. This species i tremely rare.

HIPPARCHIA ANTHE, ♀, var.

The specimens referred to under this name by Mr. A. G. (Ann. & Mag. Nat. Hist. ser. 5, vol. ix. p. 207, 1882) have returned to Col. Swinhoe; and I have had an opportunity of mining them. There may have been some mistake in the tick but the specimens returned are not of the genus *Hipparchia* they belong to *Epinephile*, and are females of *E. roxane*.

AULOCERA BRAHMINUS.

In the Society's 'Proceedings' for 1880, p. 147, Mr. Butl marks:—Mr. Moore has kindly pointed out to me that the figured by Blanchard are referable to distinct species, the male the *A. werang* of Lang." It is true that two distinct species are fi —the male, *A. brahminus*, Blanchard, and the female, the y tinted variety of *A. swaha*; but it is premature to suppres name *werang* on the strength of this plate only. There ar forms of *Aulocera* in the N.W. Himalayas having the white on the upperside very narrow:—one, of the same size as *A. s* with the underside dark and comparatively uniform in shade, is typical *A. brahminus*; the other considerably smaller, wit underside pale and beautifully variegated. This latter is *A rang* or *weranga*, as it has been more euphoniously restyled by authors; it is found at higher elevations than typical *A. brah*

It is possible that the two may be merely climatic variations of the same species; but until this is proved the name *weranga* cannot be suppressed. Col. Lang's collection, containing the types of his *A. weranga*, is now in my custody.

YPTHIMA BOLANICA, n. sp.

UPPERSIDE dark brown, distinctly glossed with purple in some lights, as in *Collerebia*. *Fore wing* with a prominent black ocellus, with two large bluish-silver pupils and narrow yellow iris, ringed with dark brown, then with mottled greyish more broadly, and then again with dark brown. *Hind wing* with one black ocellus very prominently pupilled with bluish silver, and two bluish-silver specks near anal angle, being the pupils of obsolete geminate ocelli, a submarginal sinuous dark-brown line; the margin of both wings narrowly whitish, defined on the inside with dark brown; the cilia brown. UNDERSIDE greyish white, covered more or less with fine reddish-brown striæ: *fore wing* with the ocellus as on upperside: *hind wing* with six ocelli; the first three in a line from the costa, small, the third minute, the fourth between the first and second median branches, large, the fifth and sixth geminated at the anal angle, all prominently pupilled with bluish silver as on the upperside; the cilia brown; the margin of both wings pure white, inwardly defined by a brown line, then a whitish mottled line, broadest at costa of fore wing and ending at the fifth ocellus of the hind wing; two brown lines, one on each side of the ocellus of the *fore wing*, and meeting below it continued on the hind wing as a single narrow band, on which the first three ocelli are placed, and terminating just beyond the third; a short brown line from the costa of fore wing defined exteriorly with whitish, and again another brown line continued across the *hind wing* to the abdominal margin, and on the latter wing defined exteriorly with whitish. Expanse 1·6 inch.

Taken by Lieut.-Col. C. Swinhoe (in whose collection the type specimen is) at Mach in the Bolan Pass.

DELIAS FLAVALBA, n. sp.

Male. UPPERSIDE white; costal and outer margins narrowly black: *fore wing* with the nervules beyond the cell defined with black, and all except the submedian nervure bordered on both sides with blackish irrorations, most broadly along the discocellular nervules; the outer margin also with a border of blackish irrorations, broadest at the apex. *Hind wing* with the nervures black, with a triangular patch of blackish irrorations on the margin at the extremity of each nervule, and with slight black irrorations along the median nervure, the subcostal nervules and the space between them forming there an indistinct bar; a bright yellow patch filling the space between the costal and subcostal nervures at the base of the wing, and a larger patch of the same colour at the anal angle. UNDERSIDE white: *fore wing* with the outer margin black, broadly at the apex, where it has three indistinct yellow spots at its inner edge; a broad, irregular, well-defined black patch on the discocellular nervules; the subcostal nervure to end of cell, the median and the base of its branches and the submedian at its base broadly bordered with grey irrorations, the remaining nervules narrowly bordered in the same way. *Hind wing* white, with the blackish irrorations of the upperside obsolete on the margin, but much blacker round the cell and at the base of the submedian and internal nervures; a marginal series of bright yellow spots on a pure white ground, one between each pair of nervules, and decreasing from the apex; a discal series outside the cell, elongate between the median nervules; a patch at the base, another almost filling the cell, and the entire inner margin broadly, bright yellow.

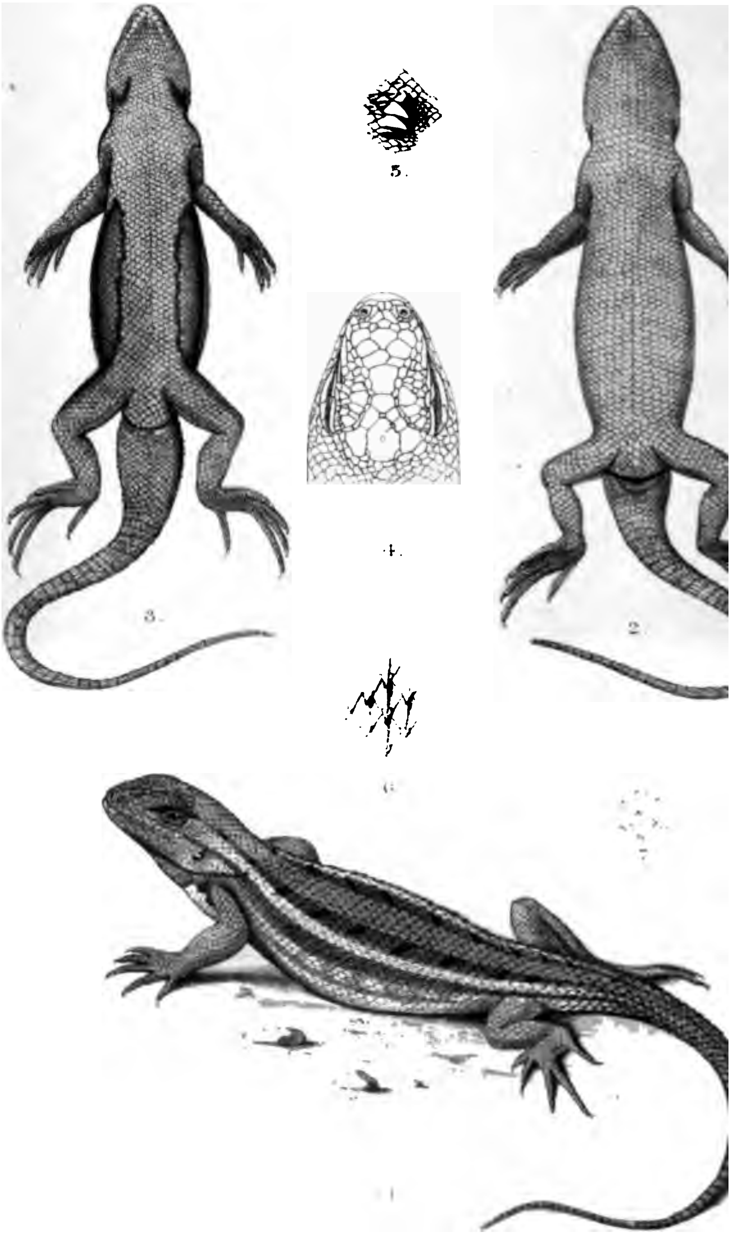
Female. UPPERSIDE as in the male, but with the black markings more developed: *fore wing* with the patch on the discocellulars as on underside of male, and a broad submarginal irrorated black band, outwardly dentate and sharply defined, inwardly diffused. *Hind wing* with a broad irrorated blackish patch round end of cell, and a diffused submarginal band from the costa disappearing below the second median nervule in some specimens, in others continued to the lower median nervule as an irrorated blackish border bearing white marginal spots; the yellow patch at anal angle fainter and more diffused; otherwise as in the male. UNDERSIDE as in the male, but with the black mark on the discocellulars larger, especially on the hind wing, and both wings with the irrorated blackish submarginal band, but much less wide than on the upperside.

Closely allied to *D. sanaca*, Moore, Cat. Lep. E. I. C. p. 79, but differing in having all the black markings greatly reduced and paler, and many of them altogether wanting, especially on the hind wing. The female is not nearly so black an insect as male *D. sanaca*; while the male is conspicuously white, with a few black markings; the yellow marginal spots on the underside of the hind wing being on a pure white ground is a very distinctive character. Expanse 3·3 to 3·5 inches.

Habitat. Kunawar in the N.W. Himalayas. The type specimens are in the collection of Col. A. M. Lang, R.E., where they have for many years stood under the above name: but no description of them has hitherto been published.

APORIA BELUCHA, n. sp.

UPPERSIDE white: *fore wing* with the nervules black, a black patch at end of the cell on the discocellulars, the outer margin broadly black, terminating abruptly at the lower median nervule, and bearing a series of irregular white marginal spots; these spots in some specimens extend to the margin, leaving only a conspicuous submarginal dark band. *Hind wing* with the outer margin and outer half of each nervure narrowly defined with black, the markings of the underside showing through by transparency. UNDERSIDE—*fore wing* as on upperside, but with the costa, apex, and outer margin suffused with pale yellow; *hind wing* pale yellow, all the nervures broadly and evenly defined with black, and a submarginal



SCELOPORUS GARMANI.

series of confluent sagittate black spots, the points acute, directed outwards between each pair of nervules; the margin narrowly black. Expanse 1·7 to 2·0 inches.

A. belucha is intermediate between *A. soracta* and *A. nobellica*; it differs from *A. soracta* in the far greater prominence of its black markings, and from *A. nobellica* in having the base of both wings on upperside white and black, and from both by its smaller size.

Habitat. Beluchistan. The type specimens were taken by Col. A. M. Lang, R.E., on the Ziārut Pass, near the Kawās valley, at an elevation of 8000 feet above the sea, on the 18th June, and are now in my collection.

For the greater part of the material for this paper I am indebted to Col. A. M. Lang, R.E., who has very kindly placed the whole of his collections and papers at my disposal for use in the 'Handbook of the Butterflies of India, Burmah, and Ceylon,' which I am now bringing out in conjunction with Mr. Lionel de Nicéville, of the Indian Museum, Calcutta.

9. Description of an apparently new Species of Lizard of the Genus *Sceloporus*. By G. A. Boulenger, C.M.Z.S.

[Received December 5, 1882.]

(Plate LVI.)

The Society, as just reported by our Secretary (above, p. 719), has received from Dr. S. Garman of Cambridge, U. S. A., five living specimens (4 females and 1 male) of a species of *Sceloporus* from Dacota, which appears not to have been described. They were sent as *Sceloporus undulatus*, var. That this Lizard is totally different from Bosc's species will be shown hereafter.

After researches among the descriptions of American authors, I came at first to the conclusion that they might be *Sc. phayeri*, Baird; but on entering more closely into the question, I had to abandon this view, and I am now satisfied that they belong to an undescribed species, allied to *Sc. gracilis*, Bd. & Gir., for which I propose the name *Sc. garmani*, in honour of Dr. S. Garman, of the Museum of Comparative Anatomy, Cambridge.

SCELOPORUS GARMANI, sp. n. (Plate LVI.)

Small species with smooth head-shields and moderate-sized dorsal scales. Length of the head contained four times or somewhat more in the distance from end of snout to vent. Head-shields normal, smooth; a row of four or five transversely dilated supraorbital shields; canthal shields two; anterior border of ear-opening with a strong denticulation formed of three or four large pointed scales - six or seven upper, and eight or nine lower labials. Dorsal sc quadrilateral; sharply pointed, strongly denticulated or rath cuspid, strongly keeled; nine scales, taken in the middle of the back, correspond to the distance from the end of the snout to the posterior border of the occipital shield; they are arranged in 42 to 44 transverse series (from occipital shield to line of hinder side of thigh) and 11 longitudinal series (a line drawn on each side from the upper edge of the ear-opening, and which corresponds in this species with the outer border of the yellowish band, being taken as the boundary between the dorsal and lateral scales); lateral scales smaller, tricuspid and strongly keeled, directed upwards; abdominal scales smooth, distinctly bi- or tricuspid, two thirds the size of the dorsals. Femoral pores 12 or 13 on each side. Limbs moderate; carried forwards, the fore limb extends beyond the snout the length of the claws of the longest fingers, the hind limb reaches the collar-fold in the male, a little beyond axilla in the female. The female exhibits the following coloration:—Upper surface of head, limbs, and tail uniform light reddish brown; a purplish-grey vertebral band, ending at base of tail; on each side two reddish-brown longitudinal bands separated by a yellowish-white narrower band commencing from the eye; a second light band from axilla to groin; more or less obsolete blackish markings, obliquely directed backwards, across the dark dorsal bands; an obsolete blackish streak at base of humerus; lower surfaces yellowish white, immaculate. The male differs in the following points:—the interval between the two yellowish-white lateral bands darker, blackish; an intensely black streak from collar-fold to forearm; a small greenish-blue spot on each side of the throat, bordered anteriorly by a few greyish dots; an elongate iridescent greenish-blue black-margined spot on each side of the belly, the white interspace between them being twice their width.

Dimensions.	♂ millim.	♀ millim.
Total length	136	136
From snout to vent	57	63
Head	14	15
Width of head	10½	12
Fore limb	23	23
Hind limb	34	33
Tail	79	73

EXPLANATION OF PLATE LVI.

Fig. 1. Female; natural size[1].
2. Ditto, lower view; natural size.
3. Male, lower view; natural size.
4. Ditto, head from above; $\frac{2}{1}$ natural size.
5. Ditto, ear-opening; $\frac{2}{1}$ natural size.
6. Ditto, dorsal scales from the middle of the back; $\frac{2}{1}$ natural size.
7. Ditto, ventral scales, from the middle of the belly; $\frac{2}{1}$ natural size.

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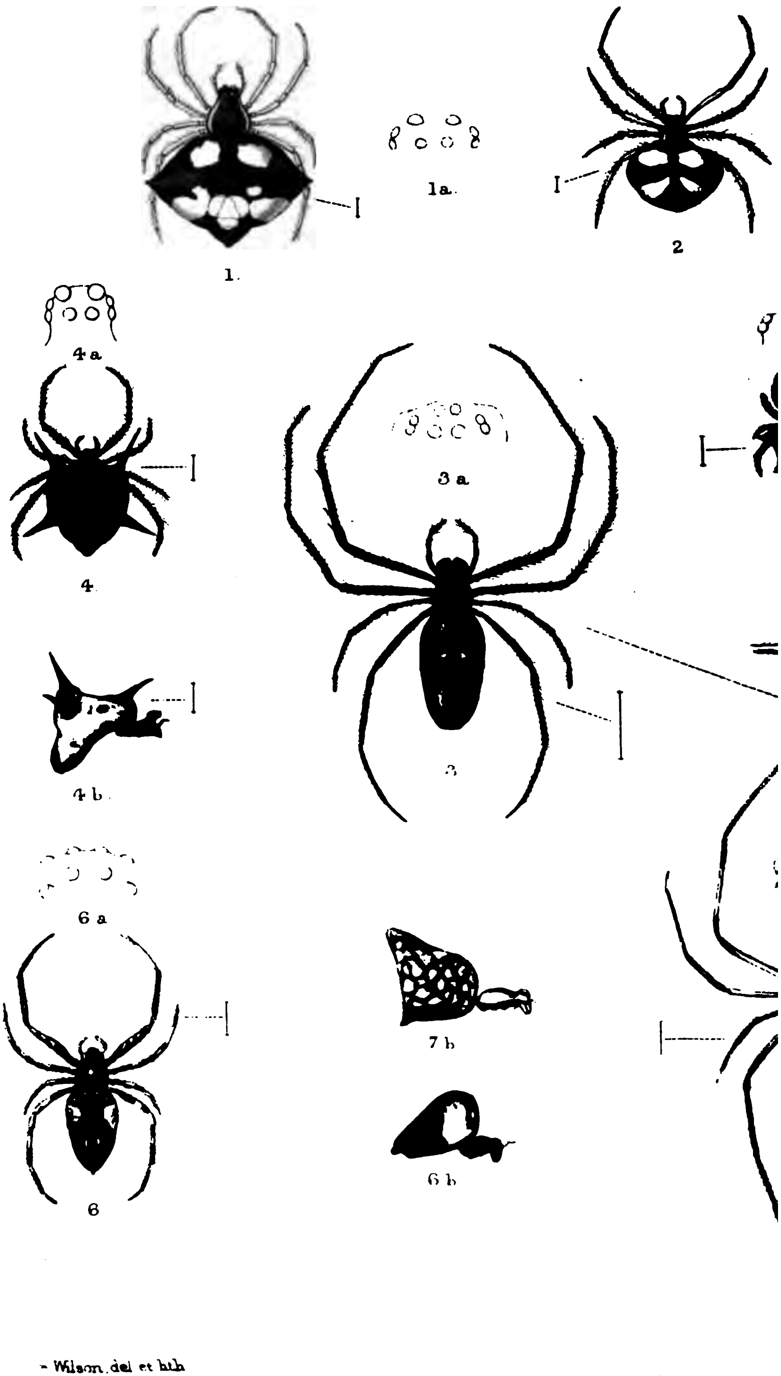
[1] From inadvertence of the artist the dorsal scales are represented a little smaller than they really are.



Wilson del et lith

SPIDERS FROM MADAGASCAR.

10. On some new or little-known Spiders from Madagascar.

By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c., Assistant Keeper of the Zoological Department, British Museum.

[Received December 5, 1882.]

(Plate LVII.)

In a large collection of Arachnida made by the Rev. Deans Cowan in Madagascar I found a few specimens of very great interest; amongst these the species of the remarkable genus *Cœrostris* have already formed the subject of a paper in the 'Annals and Magazine of Natural History' for August last. In addition to many other singular forms were specimens of the curious tailed species ***Arachnoura scorpionoides*** of Vinson, from Central Madagascar and the Betsileo country, of the beautifully coloured ***Peucetia lucasii*** from the east coast, of ***Latrodectus geometricus***, two examples of the extraordinary ***Erauchenus workmanni*** of Cambridge, a specimen of the equally bizarre ***Augusta papilionacea*** of the same author, and, last but not least, four specimens of his beautiful ***Phoroncidia aurata*** (to which last I shall have occasion to refer later on).

THERIDIIDÆ.

CHRYSSO, O. P. Cambridge.

This genus was founded in the present year (P. Z. S. 1882, p. 429), for the reception of two small Spiders from the Amazons and Ceylon. I now have to add two more from Madagascar.

1. CHRYSSO CORDIFORMIS, sp. n. (Plate LVII. fig. 2.)

♀. Falces, maxillæ, labium, sternum, and legs of a clear pale yellow colour; the cephalothorax above black, with pale yellow margins; abdomen above black, ornamented with four large transverse pyriform snow-white spots, two in front and two at the back; ventral surface dark chocolate-brown.

Cephalothorax oblong, rather narrow, slightly expanded towards the back; caput projecting in front of the eyes, in the middle, and with a slight indentation in the centre of its anterior margin, which is represented by the base of the falces: lateral eyes small, placed longitudinally at the side of the head, of equal size; the anterior pair forming a nearly straight (slightly concave) line with the anterior pair of central eyes; the latter are twice as large as the lateral eyes and are nearer together than the posterior central pair; the posterior central eyes are larger than the lateral ones, and are separated from the anterior central pair by a slightly wider interval than from one another; the eyes of the central oculiferous area therefore form an unequal square, the lateral and central posterior eyes forming a nearly straight line: abdomen convex, cordiform, pointed behind; legs cylindrical, sparsely setose, 1, 4, 2, 3. Entire length 2 millim.

Two examples: Central Madagascar.

p. 237); falces large, powerful, cylindrical, narrowing towards the culm, where in the male there is a powerful curved spine; three strong acute teeth on each side; movable claw long, acute, and curved; palpus of male rather long, with the bulb large, globular, and shining, altogether quite normal in structure, hairy; abdomen oblong, rounded behind, truncated and obtusely humped in front, the anterior portion being distinctly higher than the posterior, but depressed transversely behind the anterior border, ventral surface very slightly convex; legs long, slender, very sparsely setose, their relative length 1, 2, 4, 3. Entire length, ♂ 6½ millim., ♀ 11 millim.

East coast of Madagascar.

PHORONCIDIIDÆ.

PHORONCIDIA, Westwood.

5. PHORONCIDIA AURATA. (Plate LVII. figs. 4, 4 *a*.)

Phoroncidia aurata, Cambridge, Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 31, pl. vii. fig. 9 (1877).

Four examples of this rare and extremely beautiful species were obtained in the Betsileo country by Mr. Cowan. Two of these are typical, the abdomen being of a fiery golden colour, with black spines upon red bases; the two others are considerably larger, and the abdomen is of a metallic silver colour, the spines black with red-brown bases, and the ocellations black. This form I propose to indicate as var. *argentata* (fig. 4 *b*).

GASTERACANTHIDÆ.

GASTERACANTHA, Simon.

6. GASTERACANTHA COWANI, sp. n. (Plate LVII. figs. 5, 5 *a*.)

This species will fall into the subgenus *Isacantha*, and comes nearer to a much larger (apparently undescribed) species, a dried example of which we possess from Ceylon, than to any thing else that I have seen.

♂. Cephalothorax, palpi, and legs blackish piceous; tarsi banded with horn-yellow; maxillæ, labium, sternum, and abdomen black: abdomen above shining blackish, the anterior border narrowly sordid yellow, a central longitudinal interupted line commencing in an elongated pentagonal spot in the middle of the anterior border pale ochreous.

Cephalothorax quadrate, tumid on each side behind the caput, with strongly defined central impressed line, abruptly shelving at the back; eyes arranged much as usual, the central pairs forming a nearly equilateral quadrangle, the posterior pair slightly larger, and therefore apparently wider apart than the anterior pair; lateral eyes small, and forming the apices of the anterior angles of the caput, which ascend obliquely in the form of depressed cones from the sutural depression between the caput and the tumid thoracic region;

falces large and powerful, the movable claw curved and tapering to a fine point; palpi short, but with rather long, subcylindrical, slightly incurved, pointed, hairy terminal article; legs as usual short and hairy, with the femora somewhat flattened; sternum pentagonal, scutiform. Abdomen transverse, unequally hexagonal, the angles mammoid, terminating in short acute spines, somewhat ascending; the form of the abdomen, irrespectively of the angles, forms a truncated cone rather wider than long; the anterior margin is convex in the centre and projects at the anterior angles in the form of an obtuse tubercle in front of the anterior spines; the dorsal surface is nearly flat, slightly convex, granulose-punctate, with the impressed spots represented by rather large shallow depressions; the ventral surface is strongly granulose, shelving, and deeply pitted at the sides, convex and transversely plicated in the centre. Entire length, including the posterior pair of spines, 4 millim.; width of abdomen, including spines, at widest part, 5½ millim., at posterior lateral spines 4 millim.

Two examples: Central Madagascar.

It is possible that this may be the male of some species described from the female; but if so, the form of the abdomen differs so much as to preclude a cabinet-naturalist from determining to which species it should be assigned.

ULOBORIDÆ.

ULOBORUS, Latreille.

7. ULOBORUS VELUTINUS, sp. n. (Plate LVII. figs. 6, 6 *a*, 6 *b*.)

Cephalothorax, sternum, and coxal joints of legs dull black, covered with white pilosity; when dry the cephalothorax is brown with a white dorsal spot; remainder of legs whitish, the femora indistinctly barred with red-brown, the tibiæ partly red-brown, the hairy clothing partly tipped with black; tarsi yellowish, with black terminal articles; abdomen dull velvety-black, with four whitish dots in an arched series across the front, a broad transverse oblong yellowish patch on each side before the middle, two minute white specks in the dorsal region between the latter, and two small white spots towards the posterior extremity, ventral surface greyish.

Cephalothorax bell-shaped, shelving, slightly depressed behind the caput; eyes arranged much as usual[1], but the posterior lateral eyes as large as the posterior central pair: abdomen oval, shelving obliquely in front and behind; viewed laterally it is cuneiform with the short anterior margin arched; the edge of the transverse ridge is depressed in the middle, leaving two obtuse humps, one on either side; ventral surface deeply and transversely depressed behind the spinnerets, convex and irregularly plicated behind this depression; legs 1, 4, 2, 3, the anterior pair long, the femoral and tibial articles thick and slightly compressed, the tibiæ fringed towards the distal extremity with hair, tarsi slender; remaining legs comparatively weak, cylindrical. Entire length 5 millim.

East coast of Madagascar.

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[1] See Simon, Hist. Nat. des Araignées, p. 244.

EXPLANATION OF PLATE LVII.

Fig. 1. *Chrysso nivipictus*, p. 764. 1 *a*. Eyes.
2. —— *cordiformis*, p. 763.
3. *Meta splendida*, p. 765. 3 *a*. Eyes. 3 *b*. Male palpus.
4. *Phoroncidia aurata*, p. 766. 4 *a*. Eyes. 4 *b*. Var. *argentata*, in profile.
5. *Gasteracantha cowani*, p. 766. 5 *a*. Eyes.
6. *Uloborus velutinus*, p. 767. 6 *a*. Eyes. 6 *b*. Profile.
7. *Thwaitesia pulcherrima*, p. 764. 7 *a*. Eyes. 7 *b*. Profile.

11. On some Points in the Anatomy of the Indian Tapir (*Tapirus indicus*). By W. Newton Parker, Lecturer on Biology at the University College of Wales, Aberystwyth.

[Received December 9, 1882.]

(Plates LVIII., LIX.)

While acting as Prosector to the Society during Mr. Forbes's absence in W. Africa, I have had the opportunity of dissecting a young male Indian Tapir, a few points in the anatomy of which I now lay before the Society.

The animal, which only arrived at the Gardens in July last, was probably about eighteen months old when it was unfortunately found necessary to kill it, on October 9th, on account of its suffering from an incurable *prolapsus ani*. It measured about four feet from the tip of the nose to the tip of the tail, and had not grown perceptibly since its arrival in this country.

On opening the body the lungs were found to be much diseased, and presented considerable adherence to the thoracic cavity; the liver was also very soft. There were decided traces of rickets, the sternal ribs having several nodular enlargements.

The general anatomy of the Indian Tapir has been described by Home[1], Cantor[2], Poelman[3], and Murie[4]. Some points, however, have not received much attention; and in others there seems to be a considerable amount of variation. I therefore trust that the following account of certain of the organs will not be without interest.

The Alimentary Canal.—The hard palate presented the usual double row of transverse ridges, of which there were seventeen on the left side and eighteen on the right. The naso-palatine canals open on each side of a small elevation about $\frac{3}{5}$ inch from the posterior border of the middle incisors. The soft palate embraces the base of the epiglottis, much as in the Horse.

The tongue has a pointed apex, and increases slightly in breadth from before backwards. It measured 8 inches in length and $2\frac{3}{8}$ inches in breadth at the base. Its upper surface is covered by delicate filiform papillæ. Fungiform papillæ are also numerous, and

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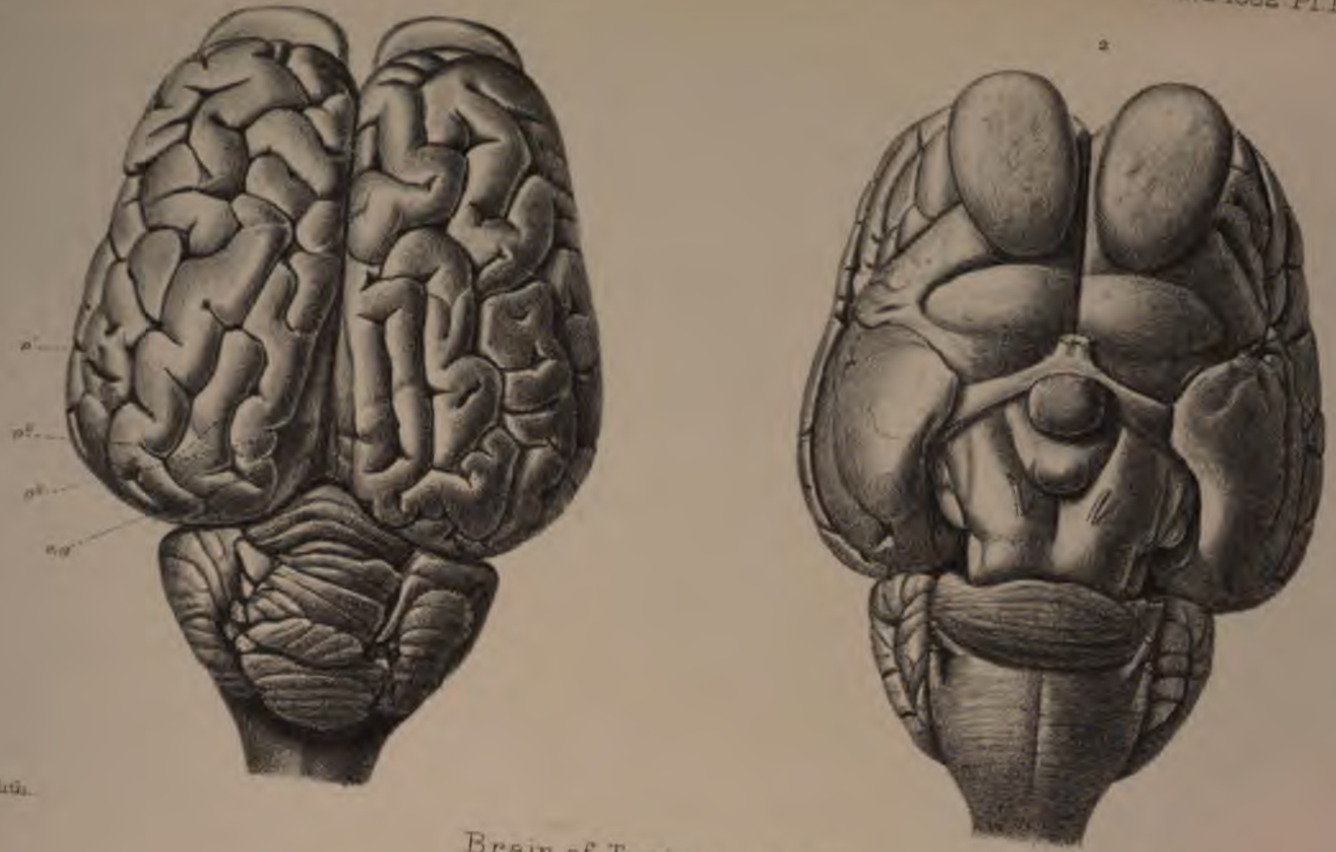
[1] Phil. Trans. 1821, p. 272.
[2] Journ. Asiat. Soc vol. xv. 1846, p. 263.
[3] Mém. de l'Acad. Roy. de Belgique, tom. xxvii. 1853.
[4] Journ. Anat. and Physiol. vol. vi. 1871, p. 131.



Brain of Tapirus indicus.

M.P. Parker lith.
West, Newman & Co imp.

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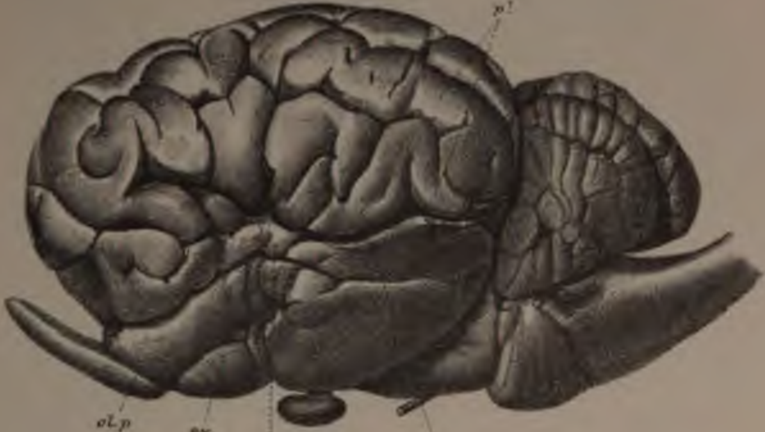

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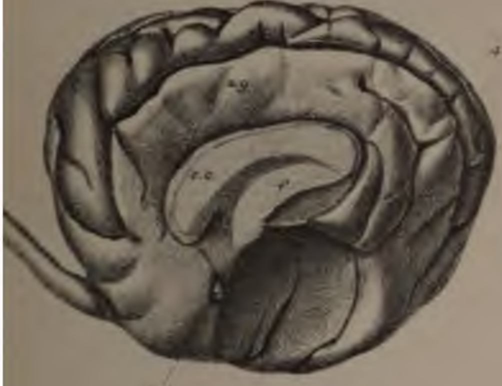

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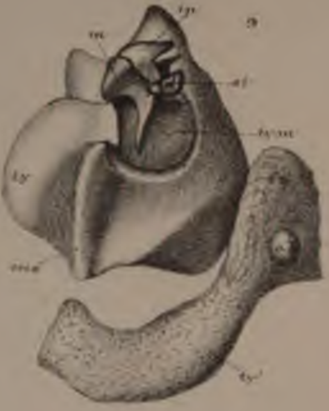

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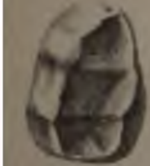

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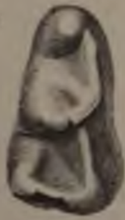

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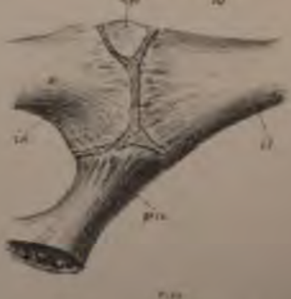

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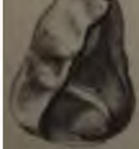

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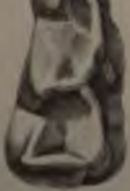

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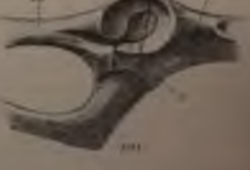


W.K.Parker lith.

West, Newman

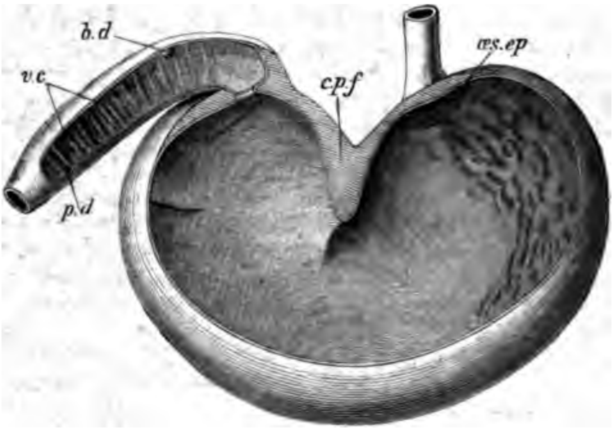
Tapirus indicus.

are distributed mainly over the anterior 2½ inches and the posterior part, there being a space of about 2 inches between these regions which is destitute of them; there is also an irregular row along each edge. There is a distinct Mayer's organ (*papilla foliata*) on each side, about half an inch long, on the upper edge of the root of the tongue. The frenum was attached about 3 inches from the apex.

The salivary glands resemble those of the Horse in every important particular. The parotids are large, extending from the front part of the hinge of the lower jaw to the paroccipital process. Steno's duct passes down along the lower edge of the masseter, and then runs up again so as to open by an aperture with well-marked lips about ⅜ inch from the upper molar teeth, opposite the line of apposition of the second and third molars. The submaxillary and sublingual glands were also large, their ducts opening in the usual position. Upper and lower molar glands were present; and there was a large palatal gland over the velum palati. The tonsils did not present any definite elevations, the glands composing them being scattered. Each thyroid was about 1 inch long, and was connected with its fellow by a bridge ⅜ of an inch in width.

Poelman figures an external view of the stomach, which, however, does not represent it quite accurately. I therefore give another figure (fig. 1), showing its internal structure.

Fig. 1.



The stomach, laid open, from the posterior side, one fourth nat. size.
c.p.f, cardio-pyloric fold; *œs.ep*, œsophageal epithelium; *b.d*, bile-duct; *p.d*, pancreatic duct; *v.c*, valvuli conniventes.

The stomach measured about two feet along the greater curvature. There is a marked constriction between the entrance of the œsophagus and the duodenum, about halfway between the two, and not close to the duodenum as in Poelman's figure, in which also the œsophagus and duodenum, the latter especial sented of much too small a diameter and too far apart Murie points out, making the lesser curvature smaller From the cardio-pyloric constriction there extends inw 2 inches a thickened muscular septum (*c.p. f*), w divides the stomach into a cardiac and a pyloric cham the cardiac is slightly the larger.

The epithelial lining of the œsophagus extends into for about an inch all round from the cardia (*œs. ep* differs from *T. americanus*[1], in which the œsophage extends much further over the interior of the stomach, arrangement in the Rhinoceros and Horse. The great mucous membrane is very smooth; but for a region ext the cardiac portion of the greater curvature it is consid There are also a few slight ridges in the pyloric end. coat thickens considerably towards the pylorus; and t marked circular pyloric valve.

The duodenum is of considerably greater diameter diac end of the œsophagus; but it narrows slightly a first 5 inches, the rest of the small intestine having an meter of about 1$\frac{3}{8}$ inch.

The liver has been figured by Murie; but his sketch

Fig. 2.

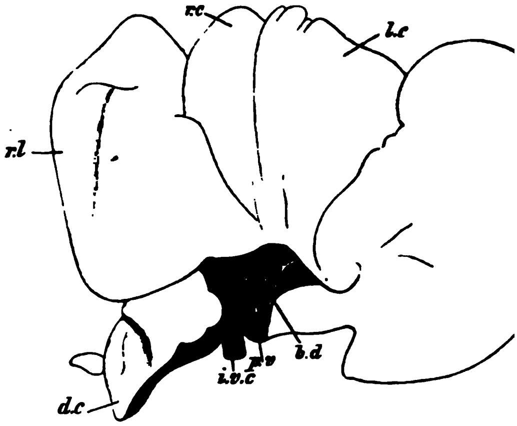


Diagram of the liver, from the posterior aspect, three-eight *r. c*, right, and *l. c*, left central lobe; *r. l*, right, and *l. l*, left *d. c*, caudate lobe; *b. d*, bile-duct; *p. v*, portal vein; *i. v. c*,

derably from this gland in the specimen under consider therefore give a figure for comparison (fig. 2), to sh organ, as in many other Ungulates, may vary considera

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[1] See Owen, Proc. Zool. Soc. 1841, p. 161.

The right and left central lobes were only partially separated from one another, the umbilical fissure extending only a short way down on the anterior side. The margin of the left central lobe presented several small notches towards its right side. Both right and left lateral lobes were large; and there was a considerable caudate lobe, projecting from the outer side of which there was a small leaf-like minor lobe. There was no *lobus Spigelii*; in Dr. Murie's figure a large one is shown, but no caudate; he states that a small lobule lying on the vena cava might represent the latter.

There is no gall-bladder; and the bile-duct opens on a papilla into the duodenum about 3 inches from the pylorus. A separate pancreatic duct opens about 3⅛ inches further back.

The spleen is elongated and flattened; it measured 1 foot long, and about 4 inches broad in the widest part.

It has usually been stated that the intestinal canal is much shorter in the American than in the Indian Tapir; but the measurements given by different anatomists vary so much that it is impossible to make any very definite statements on the subject. Murie gives a table comparing the measurements by himself, Home, Poelman, Owen, and Turner[1]; and maintains that the length of the alimentary canal depends quite as much on age, sex, &c. as on mere specific distinction. Adding to these measurements those by Yarrell[2], Cantor, and myself[3], they give the following results:—In both species the intestine is longer in the adult male than in the adult female, but longer in the latter than in the young male. It is longer in the adult male Indian Tapir than in the adult male American, but longer in the latter than in the female Indian. But, on the other hand, there is a difference of over 20 feet between Home's and Poelman's measurements in adult Indian males; and this seems to show that the intestinal length varies so greatly as to be of comparatively little importance as a specific distinction.

Well-marked *valvuli conniventes*, about ⅜ inch apart, and covered with close-set villi, extend through about the first 18 feet of the small intestine, after which they gradually fade off, the mucous membrane of the rest of the ileum being smooth. The distribution of these valvulæ differs very much from what occurs in *T. americanus*, in which Owen states that they only extend 4 or 5 inches from the pylorus.

Peyer's patches were numerous but small, some reaching to 1 inch in length, but the average size being about ½ inch.

The cæcum (fig. 3, p. 772) resembles that of the Rhinoceros. Three muscular bands extend down it; and between these it is sacculated. The colon, which is sacculated on either side of two muscular bands, forms a loop, and then passes insensibly into the rectum, which nearly resembles it in structure. The mucous membrane of the

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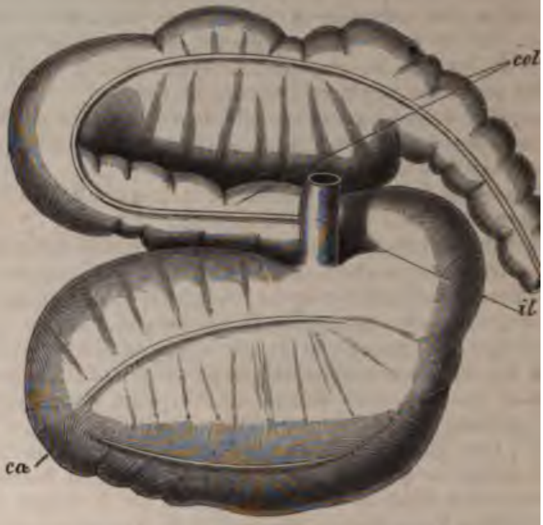
[1] Proc. Zool. Soc. 1850, p. 102.

[2] "Observations on the Tapir of America," Zool. Journal, vol. iv. 1828, p. 210.

[3] The small intestine was 40 feet 9 inches long, the large intestine 5 feet 6 inches, and the cæcum 10 inches, measuring from the apex to the entrance of the ileum.

cæcum is raised into a close network of wrinkled folds ; tl
colon and rectum is similar, but the network is not quite s

Fig. 3.



Cæcum and colon, from above, one sixth nat. size.
cæ, cæcum ; *col*, loop of colon ; *il*, ileum.

The heart agreed with Poelman's and Owen's descripti
the subclavians come off from the innominate ; and there i
superior cava. There is no moderator band in the right
and I could find no trace of an os cordis. A very good fi
heart is given in Poelman's paper. The external and int
arise separately from the aorta.

Each lung was imperfectly divided up into three lob
posterior and two smaller anterior ; and there was also a
gous lobe on the right side. This differs from Poelman's
in that he states that in the right lung there is only
division, and he does not mention the azygous lobe.

The larynx corresponded with Poelman's description, sl
double pair of pouches figured by him.

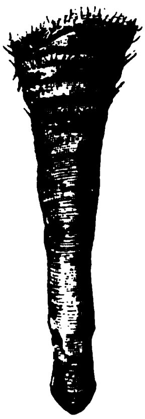
The kidneys are not lobulated, and in longitudinal sect
large extent of the cortical part as compared with the
The right was slightly longer and narrower than the left,
measuring $5'' \times 2\frac{1}{4}''$, and the latter $4\frac{1}{2}'' \times 2\frac{1}{2}''$. The a
elongated bodies about $\frac{1}{2}''$ wide, extending from the front
the kidney to the exit of the ureter. In section they sho
cortical and a brownish medullary part. The bladder h

neck; and the ureters open close together about two thirds of the way back from its anterior end. These openings are separated by a longitudinal fold of the mucous membrane, which extends backwards as far as the veru montanum.

The animal being young, the generative organs were in such an undeveloped condition that I am unable to give a good description of them. The testes were only about $\frac{5}{8}$ inch long; but the epididymes were large. The vesiculæ seminales were branched; and the seminal ducts and prostates opened by numerous slit-like apertures on either side of the veru montanum. Extending for some distance behind the latter there were several irregular rows of apertures of mucous glands.

The penis (fig. 4) differed considerably in form from Poelman's figure. He describes three ridges (crêtes) or flattened pads (bourrelets aplatis) on the upper surface: these were not present; but just behind the glans there was a squarish forwardly directed fold. The glans was conical; and the lower lip of the urethral aperture projected slightly.

Fig. 4.



Upper surface of penis, one half nat. size.

The brain (Plates LVIII., LIX., figs. 1–4) resembles on the whole that of the Rhinoceros and Horse; but the convolutions are simpler, and the hemispheres relatively shorter, appearing almost round when viewed from the side; seen from above, they do not show such a marked difference in breadth between the anterior and posterior parts as in the Rhinoceros, and in this more nearly resemble the Horse. The olfactory lobes are very large and of an oval shape, and are marked off by a groove from their peduncles. The peduncles of the hemispheres form marked oval elevations between the lobes and optic chiasma.

Dareste[1] gives a short description and diagram of the co of the brain in the American Tapir; and Broca, in his memoir (Anatomie comparée des circonvolutions cérébr scribes the convolutions more fully, giving diagrams of an an internal, and a posterior view of the hemisphere; he, does not state to what species his description refers. figure differs entirely from the specimen under considerati also does not altogether agree with Broca's account.

The posterior part of each hemisphere presents three which are much twisted, and differ considerably on oppo the outer of these is folded on itself at the posterior e broader than the other two taken together. These cons four parietal convolutions of Broca. The internal and ext can be traced to the frontal region of the hemisphere; middle one, which is the simplest, stops short at about t junction between the anterior and middle thirds. The gyrus is much folded in front.

At about the middle of the hemispheres, the inner bor internal gyrus passes gradually outwards, so that the post of the callosal gyrus can be seen from above, thus differing Rhinoceros and resembling the Horse. There is a de between the parietal and temporal lobes; and this fissur "arc inférieur de la scissure limbique") extends forwar curved line to the rudimentary Sylvian fissure, beneath seen the small convolutions of the island of Reil; these tuted by the temporo-frontal fold, the other sub-Sylvian parietal) fold described by Broca not being present. The lobe is smooth.

The corpus geniculatum and corpus mamillare are wel The pons Varolii is rather narrow, while the crura cerebri

The cerebellum, though relatively larger, resembles c of the Horse, and presents the same irregular appearance.

On viewing the hemisphere from the inside (Plate LI the calloso-marginal sulcus ("arc supérieur de la scissure of Broca) is seen to bend down in front of the corpus call the Rhinoceros and Horse, and does not, as in the Sheep other Ungulates, become superficial anteriorly. The lar gyrus is divided into two in its posterior part by a l fissure.

Teeth.—All the milk-teeth were in place, the dental for d. i. $\frac{3-3}{3-3}$, d. c. $\frac{1-1}{1-1}$, d. m. $\frac{4-4}{3-3}$. This corresponds with the ments on the subject. Behind these, traces of the deve and second true molars could be detected in the dry entirely within their sockets. The last upper and lower deciduous molars had evidently only just come into place.

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[1] "Troisième mémoire sur les circonvolutions du cerveau chez fères," Ann. d. Sci. Nat. 4e série, Zool. iii. 1855, p. 65.

Revue d'Anthropologie, t. vii. 1878, p. 385.

De Blainville[1] gives a description of several stages in the development of the Tapir's teeth; but he is not at all clear on one or two important points, which I now hope to explain.

On cutting into the jaws, distinct germs of the first and second premolars were seen, in the form of small conical cups, one for each main cusp; and of these the second in the lower jaw were the largest. There were no traces of the third or fourth premolars.

It is a general rule amongst mammals that the first premolar has no predecessor, or else, perhaps, that this tooth is really a permanent milk-tooth, the only exception usually given to this rule being in the case of *Hyrax*[2]. In reference to the former of these views, it is well known that there is a tendency in many mammals towards the suppression of the milk-teeth, as, for instance, in the Rabbit[3], this being carried to an extreme in Marsupials, as Prof. Flower has shown[4], and (as far as is yet known) in the Guinea-pig, in which animals the last is the only one left. On the other hand, as will be seen later on, the fact that in the Tapir the first milk-molar is considerably larger than its successor might be taken in support of the first view. It is thus interesting to find a more primitive condition in the dentition of animals like the Tapir and Hyrax.

A comparison of the dentition of the young with that of older animals is instructive. As in the Horse[5] and other Ungulates, the last deciduous molar remains functional for a long while, probably for some time after the animal is fullgrown; and it can be at once distinguished by its worn appearance.

The first molar of the Horse appears long before the milk-molars are shed, and, by the time *all* the permanent teeth have appeared, is considerably worn. Thus an examination of a Tapir's skull in which, though apparently adult, the last milk-tooth had not been shed, might easily mislead one, and give the idea that there were only three premolars above and two below.

That this is not the case is proved by the skull of an American Tapir in the Biological Museum of the Normal School of Science, to which Prof. Huxley has drawn my attention. In this, though apparently a nearly adult animal, the last milk-molars above and below were still functional, and above them, in the sockets, are the teeth which were destined to take their place. Prof. Huxley has also kindly allowed me to make a section of the jaw of an Indian

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[1] 'Ostéographie,' tome iii.

[2] Both de Blainville and Owen (Odontography, p. 605) state that in the Tapir the first deciduous molar is succeeded by a permanent one; but some doubt is thrown on this conclusion by Huxley, in his 'Comparative Anatomy of Vertebrated Animals,' p. 365.

[3] See footnote on page 655 of Prof. Huxley's article "On the Application of the Laws of Evolution to the Arrangement of the Vertebrata," P. Z. S. 1880.

[4] Phil. Trans. 1867.

[5] Prof. Owen states (Odontography, p. 581) that in the Horse the last deciduous molar is usually not shed until the last true molar has appeared.

Tapir, evidently older than the above. This shows exactly the same thing—the last milk-molars still in place and much worn, the corresponding premolars in their sockets in the jaw, and the first true molars above and below in place, the last two (sixth and seventh above, and fifth and sixth below) not having yet come into use.

Prof. Flower has shown me a series of Tapir's skulls in the College of Surgeons' Museum, in which the different stages of the first premolar can be seen, up to the time at which it takes its place amongst the others.

Comparing the patterns of the milk-teeth with the permanent ones, they, with the exception of the first, are seen to resemble one another very closely. The inner cusp of the first deciduous molar is much larger than in its successor, and thus more nearly resembles the pattern of the other grinders; moreover, both upper and lower first milk-molars are considerably larger than their successors (see Plate LIX. figs. 5–8). The outer incisiors in both jaws are relatively not so large as in the adult, being only about the same size as the inner and middle ones; the canines also are relatively smaller.

In the skeleton I have only a few remarks to make on certain parts of the skull and on the pelvis.

The tympanic bone, with the external meatus, is small, and does not become ankylosed to the surrounding parts; so that it is rarely seen in dry skulls. Between the tympanic and periotic, on the lower side, is a flat, somewhat curved fibro-cartilage (Plate LIX. fig. 9, *ty'*), which passes posteriorly into a mass of fibrous tissue, in which is imbedded a very definite os bullæ (*o.b*), similar to those which exist in the Pig[1], Bat, &c., except that in these animals there are more than one. The fibro-cartilage is the homologue of that part of the tympanic which, in such mammals as the Carnivora, becomes ossified separately to form the bulla[2]; and the os bullæ corresponds roughly to this ossification. In these mammals the tympanic ossifies by two centres, one forming the outer part, and giving rise to the external meatus and to the region which gives attachment to the membrana tympani, and the other forming the bulla. These two parts eventually completely fuse together. Thus in the Tapir, Pig, and Bat only the outer ossification becomes of any physiological importance, the inner one remaining in a rudimentary condition.

The stapes is elongated, as in other Ungulates; and there is a distinct interhyal cartilaginous nodule imbedded in the tendon of the stapedius muscle.

Above the pterygoid proper there is a separate mesopterygoid centre in the form of a thin scale of bone on each side. This is common in Marsupials, and exists also in the Fox and Pig[3].

In the pelvis there was a small separate ossification on the upper and inner border, at the junction of the ilium and ischium (Plate LIX. fig. 10 *ep*). I do not know that an ossification has been described in this region before, though a small bone, the cotyloid, lying between these elements on the lower border of the acetabulum, from which it completely excludes the pubis, is well known in some Carnivora[1], and, as my friend Mr. G. B. Howes has pointed out to me, is invariably present in the Rabbit (fig. 11, *c*). Both these ossifications are probably to be regarded only as epiphyses.

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[1] See W. K. Parker, "On the Structure and Development of the Skull in the Pig," Phil. Trans. 1874.

[2] See Prof. Flower, "On the Value of the Characters of the Base of the Cranium in the Classification of the order Carnivora," P. Z. S. 1869, pp. 15–17.

[3] *Cf.* W. K. Parker, *loc. cit.* p. 324.

EXPLANATION OF PLATES LVIII., LIX.

Fig. 1. Brain, superior view: p^1, outer parietal convolution; p^2, middle parietal convolution; p^3, inner parietal convolution; *c. g*, callosal gyrus: natural size.
2. Brain, inferior view, natural size.
3. Brain, lateral view, natural size: *in*, island of Reil; *ol. p*, olfactory peduncle; *p.t. s*, parieto-temporal sulcus; *sy*, rudimentary Sylvian fissure.

The outlines of figs. 1–3 were taken from a cast of the cranial cavity.

Fig. 4. Internal view of right cerebral hemisphere: *a. c*, anterior commissure; *f*, body of fornix; *c. c*, corpus callosum; *c. g*, callosal gyrus, above which is seen the calloso-marginal sulcus.
5. Crown of first upper premolar, nat. size.
6. „ „ upper milk-molar, nat. size.
7. „ „ lower premolar, nat. size.
8. „ „ lower milk-molar, nat. size.
9. Internal view of right tympanic bone (*ty*), showing also the tympanic fibro-cartilage (*ty'*), which is slightly displaced downwards, and the os bullæ (*o. b*): *m*, malleus; *in*, incus; *st*, stapes; *ty. m*, tympanic membrane; *eus*, eustachian groove; *f. t*, mass of fibrous tissue in which the os bullæ is imbedded: two thirds nat. size.
10. The acetabular region of the left innominate bone, from the inner side: *il*, ilium: *is*, ischium; *pu*, pubis; *cp*, epiphysis: one half nat. size.
11. The same region of the right innominate bone of a Rabbit, from the outer side: *c*, cotyloid bone; *c. n*, cotyloid notch; *il*, ilium; *is*, ischium; *pu*, pubis: nat. size.

12. Descriptions of a new Genus and some new Species of Heterocera. By HERBERT DRUCE, F.L.S., F.Z.S.

[Received December 19, 1882.]

(Plates LX. & LXI.)

Examples of the species here described have been received by me from time to time during the last two or three years, and added to my collection. The specimens of the new *Castniæ* were collected by Mr. C. Buckley in Ecuador, and form part of a very fine series of Heterocera from that country, containing a large number of new species. A complete list of this collection, with descriptions of the new species, I hope to be able to publish shortly.

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[1] Milne-Edwards, 'La Physiol. et l'Anat. comp.' tome x. p. 358.

Fam. SPHINGIDÆ.

CHŒROCAMPINÆ, Grote.

CHŒROCAMPA, Duponchel.

CHŒROCAMPA WOLFI, n. sp. (Plate LX. fig. 1.)

Wings above pale brown or brownish grey. Primaries crossed by a pale band from the apex to the inner margin, the outer margin paler, but the wing shading to dark brown up to the band crossing them below the cell. Secondaries almost black, crossed below the middle by a pale indistinct ochreous band. Underside pale brown, thickly speckled with reddish scales. Head, thorax, and abdomen pale brown.

Expanse 2½ inches.

Hab. Ecuador, St. Lucia (*Wolf*).

A small species allied to *C. docilis*, Butler, but quite distinct.

Fam. CASTNIIDÆ.

CASTNIA, Fabricius.

CASTNIA MARS, n. sp. (Plate LX. fig. 2.)

Allied to *C. cononia*, Westwood. Similar in shape and colour, the band of the anterior wings dusky yellow, instead of pure white as in *C. cononia*; posterior wing crossed by a wide central black band extending almost to the outer margin, not broken up into small spots as in *C. cononia.*

Expanse 3¾ inches.

Hab. Ecuador, Sarayacu (*Buckley*).

A well-marked species, easily distinguished from *C. cononia.*

CASTNIA BUCKLEYI, n. sp. (Plate LX. fig. 3.)

Allied to *C. truxilla*, Westwood. Anterior wings more dusky, the basal third only being black, a marginal row of yellowish spots not reaching the apex. Posterior wing of the male black, banded along the costal margin to the middle of the hind margin with orange-brown. *Female*: the anterior wings the same as the male; posterior wings rich orange-brown, with a marginal row of pale orange-yellow spots, the outer margin black.

Expanse 3½ inches.

Hab. Ecuador, Intaj (*Buckley*).

Mr. Buckley only obtained a pair of this fine species.

Fam. AGARISTIDÆ.

HESPAGARISTA, Walk.

HESPAGARISTA TIGRINA, n. sp. (Plate LX. fig. 4.)

Primaries black, the outer margin reddish brown, two yellowish white bands close to the base, a white streak at the end of the cell, and beyond it a wide yellowish-white band broken into two small spots at the anal angle; between these are some transverse blue streaks. Secondaries bright orange, with the outer margins broadly black, the fringe black and white. Underside—primaries black, the base yellow, the white streak at the end of the cell and the band beyond the same as above, the outer margin brown; secondaries as above, the black outer margin enclosing a series of white spots.

Expanse 1¾ inch.

Hab. West Africa, Calabar and Cameroons.

This species is allied to *H. interlecta*, Angus, but very distinct.

Fam. CHALCOSIIDÆ.

Callhistia, n. gen.

Allied to *Histia*. Neuration almost the same; but the costal margin very much more arched; the body much thicker and longer, projecting beyond the wings. Palpi very short. Secondaries broad, and elongated to a point at the apex.

Type *C. grandis*.

This genus is intermediate between *Gynautocera* and *Histia*.

Callhistia grandis, n. sp. (Plate LX. fig. 5.)

Primaries black, the base shot with brilliant Prussian blue, crossed in the middle by a wide scarlet band. Secondaries with a central yellow band extending from the costal to the inner margin. Underside the same as above. Head and thorax black. Abdomen yellow, with black bands. Antennæ wanting.

Expanse 3¼ inches.

Hab. New Guinea, Port Moresby (*Goldie*).

Epyrgis, H.-Sch.

Epyrgis forbesi, n. sp. (Plate LX. fig. 6.)

Primaries dusky white, with black veins. Secondaries pure white, clouded with pale chrome-yellow from the anal angle to beyond the middle; the apex and the outer margin black.

Expanse 2¼ inches.

Hab. Java, Bantam (*Forbes*).

Nearly allied to *E. binghami* of Butler, from which it differs in not having black spots on the primaries.

Fam. ARCTIIDÆ.

Hypercompa, Steph.

Hypercompa thelwalli, n. sp. (Plate LXI. fig. 1.)

Primaries bright chrome-yellow, shading to dark orange along the hind margin, crossed by four irregular bluish-black bands, the one nearest the outer margin broken in the middle and forming two elongated spots; the apex and outer margin black. Posterior wing dark orange-yellow, a spot at the end of the cell and the outer margin broadly black. Underside the same as above. Head and thorax spotted with black. Abdomen yellow above, black on the underside.

Expanse 2$\frac{3}{4}$ inches.

Hab. East Africa, Nyassa (*Thelwall*).

This beautiful species is allied to *H. bellatrix*, Dalman, from South Africa.

Fam. NYCTEMERIDÆ.

Nyctemera, Hübner.

Nyctemera acræina, n. sp.

Primaries dusky brown; the nerves all black, except on the white band which crosses the wings from about the middle of the costal margin nearly to the anal angle. Secondaries—the basal half pure white, the outer half yellowish brown, shading to dark brown on the costal margin. Antennæ black. Head, thorax, and upperside of abdomen brown; underside yellow.

Expanse 3 inches.

Hab. West Africa, Calabar.

I at first thought that this species would be better placed in the genus *Aletis*; but on comparing the neuration with specimens of *Nyctemera apicalis* which I have had mounted in Canada balsam, I find that it is the same. This and the following species are the two largest described in this genus. At first sight they might easily be taken for *Acrææ*.

Nyctemera chromis, n. sp. (Plate LXI. fig. 2.)

Closely allied to the preceding species. The primaries the same, only slightly more yellow. Secondaries chrome-yellow, shading to pale brown on the outer margin. Underside the same as above. Head and thorax black. Abdomen brown above; underside yellow.

Expanse 2$\frac{3}{4}$ inches.

Hab. West Africa (*Thomson*).

Otroeda, Walker.

Otroeda varunæa, n. sp.

Primaries pale chrome-yellow, partly crossed by two black bands, broadest on the costal margin, tapering to a point near the anal angle; apex broadly black; a submarginal row of five white spots, the first two the largest. Secondaries pale chrome-yellow, the outer margin black, with a submarginal row of white spots. Underside the same as above. Head black. Thorax and abdomen yellow.

Expanse 2$\frac{3}{4}$ inches.

Hab. West Africa, Congo.

This species is allied to *Otroeda vesperina* of Walker. It is a much smaller and more pale-coloured insect.

Fam. EUSCHEMIDÆ.

EUSCHEMA, Hübner.

EUSCHEMA SAGANA, n. sp. (Plate LXI. fig. 3.)

Primaries—the basal half chrome-yellow, the outer half bluish black, crossed by two bands of semitransparent white spots. Secondaries chrome-yellow, a black spot at the end of the cell; the apex and a submarginal row of spots black. Head, thorax, and abdomen yellow.

Expanse $3\frac{1}{8}$ inches.

Hab. Cochin China (*Boucard*).

This species resembles *E. militaris* in form, but is very distinct, wanting the black spots on the wings of that species.

MILIONIA, Walker.

MILIONIA BUTLERI, n. sp. (Plate LXI. fig. 4.)

Nearly allied to *M. güntheri* of Butler, but more brilliant in colour, the bands of the primaries wider, and the outer margin of the posterior wings brighter scarlet, the marginal black band broken into small round spots.

Expanse $2\frac{1}{4}$ inches.

Hab. Sumatra (*Bock*).

I have named this fine species after my friend Mr. Butler, who has already described several species of this beautiful genus.

BOCIRAZA, Walker.

BOCIRAZA GOLDIEI, n. sp. (Plate LXI. fig. 5.)

Primaries black, crossed in the middle by a wide orange band, the apex tipped with white. Secondaries black, crossed from the costal margin to near the anal angle by a yellow band tapering almost to a point. Underside the same as above. Head, thorax, and abdomen black.

Expanse $1\frac{7}{8}$ inch.

Hab. New Guinea, Port Moresby (*Goldie*).

BOCIRAZA SEPARATA, n. sp. (Plate LXI. fig. 6.)

Primaries black, the costal half chrome-yellow, extending to the anal angle. Secondaries black. Underside the same as above. Head and front of thorax yellow; back of thorax and abdomen black.

Expanse $1\frac{1}{2}$ inch.

Hab. New Guinea, Port Moresby (*Goldie*).

Fam. URANIIDÆ.

LYSSIDIA, Westwood.

LYSSIDIA GOLDIEI, n. sp.

Male and female. Upperside dark brown. Anterior wings crossed beyond the middle by a well-defined white band broadest on the costal margin, tapering to a point at the anal angle; the costal

margin spotted with black as in all the species of *Lyssidia*.
terior wing crossed near the middle by a narrow pale brow
the outer margin thickly speckled and streaked with dark
the apex and the tails white. Underside pale brown, thickly s
and streaked with dark brown; the white band of the p
wings ill-defined, and only crossing the wing from the middl
anal angle.

Expanse—male 5¼ inches, female 6¼ inches.

Hab. New Guinea, Port Moresby (*Goldie*).

This species is allied to *Lyssidia macleayii* of Montrouzier
seridia macleayii, Westwood), specimens of which are in
lection from the Duke-of-York Island and New Ireland. It
in many respects from that species.

EXPLANATION OF THE PLATES.

Plate LX.

Fig. 1. *Chærocampa wolfi*, p. 778.
2. *Castnia mars*, p. 778.
3. —— *buckleyi*, p. 778.
Fig. 4. *Hespagarista tigrina*,
5. *Callhistia grandis*, p.
6. *Epyrgis forbesi*, p. 77

Plate LXI.

Fig. 1. *Hypercompa thelwalli*, p. 779.
2. *Nyctemera chromis*, p. 780.
3. *Euschema sagana*, p. 781.
Fig. 4. *Milionia butleri*, p. 7
5. *Bociraza goldiei*, p. 7
6. —— *separata*, p. 781.

APPENDIX.

LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1882.

Jan. 1. 1 Malbrouck Monkey (*Cercopithecus cynosurus*). Deposited.

3. 1 Crab-eating Raccoon (*Procyon cancrivorus*). Presented by H. B. Whitmarsh, Esq.

2 Pileated Jays (*Cyanocorax pileatus*), ♂ and ♀. Presented by C. S. Barnes, Esq.

1 Short-eared Owl (*Asio brachyotus*). Presented by R. M. Christy, Esq.

4. 1 Blue-eyed Cockatoo (*Cacatua ophthalmica*). Deposited.

2 Lesser Black-backed Gulls (*Larus fuscus*). Presented by Mrs. Brindley.

5. 6 Grey Squirrels (*Sciurus cinereus*), var. *nigra*, 2 ♂, 4 ♀. Purchased.

6. 1 Gayal (*Bibos frontalis*), ♂, Born in the Gardens. See P. Z. S. 1882, p. 233, pl. x.

7. 1 Painted Terrapin (*Clemmys guttata*). Presented by W. A. Forbes, Esq., F.Z.S.

3 Confluent Rattlesnakes (*Crotalus confluentus*). Presented by W. A. Forbes, Esq., F.Z.S.

10. 1 Ring-tailed Coati (*Nasua rufa*). Presented by John Verinder, Esq.

12. 7 Italian Scorpions (*Scorpio italicus*). Presented by T. D. G. Carmichael, Esq.

13. 2 Macaque Monkeys (*Macacus cynomolgus*), ♂ and ♀. Deposited.

2 Arabian Gazelles (*Gazella arabica*) ♂ and ♀. Deposited.

14. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by Mr. Kessels.

3 Young Otters (*Lutra vulgaris*), 2 ♂, 1 ♀. Presented by the Reading Angling Association.

16. 1 Malayan Bear (*Ursus malayanus*). Purchased.

17. 1 Markhoor (*Capra megaceros*), ♀. Presented by Lieut.-Col. St. John. See P. Z. S. 1882, p. 233.

A collection of Sea-Anemones. Presented by Mr. A. D. Bartlett.

19. 1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by Miss Morson.

Jan. 19. 1 Cashmere-Shawl Goat (*Capra hircus*, var.). Born in Gardens.
1 Common Raven (*Corvus corax*). Presented by S. J. El Esq.
1 Spanish Terrapin (*Clemmys leprosa*). Presented by H. four, Esq.
23. 1 Toque Monkey (*Macacus pileatus*), ♂. Presented by Evans.
24. 1 Chimpanzee (*Anthropopithecus troglodytes*), ♀. Deposite
27. 1 Azara's Fox (*Canis azaræ*). Presented by Owen E. G Esq.
28. 1 Bengal Vulture (*Gyps bengalensis*). Presented by Capt. Leportier.
30. 1 Cirl Bunting (*Emberiza cirlus*). Purchased.
2 Snow-Buntings (*Plectrophanes nivalis*). Purchased.
2 Mountain-Linnets (*Linota flavirostris*). Purchased.
31. 1 Mountain Ka-Ka (*Nestor notabilis*). Deposited.

Feb. 1. 1 Ring-tailed Lemur (*Lemur catta*). Presented by Capt. M Webster.
2. 1 Sykes's Monkey (*Cercopithecus albigularis*), ♂. Presente H. Gunning, Esq.
2 Badgers (*Meles taxus*). Presented by C. R. Meltzer, Esq
2 Common Barn-Owls (*Strix flammea*). Presented by M Golden.
4. 1 Cinereous Sea-Eagle (*Haliaetus albicilla*). Presented by Hon. M. Finch-Hatton.
7. 1 Common Otter (*Lutra vulgaris*). Purchased.
1 Amherst Pheasant (*Thaumalea amherstiæ*), ♂. Presente John Biehl, Esq.
1 Californian Quail (*Callipepla californica*), ♀. Deposited.
8. 4 Warty-faced Honey-eaters (*Xanthomyza phrygia*). Purcha See P. Z. S. 1882, p. 311.
1 Pink-footed Goose (*Anser brachyrhynchus*). Purchased.
2 Musk-Ducks (*Biziura lobata*), 2 ♂. Purchased. See P. 1882, p. 311.
9. 1 Red-fronted Lemur (*Lemur rufifrons*), ♂. Purchased.
10. 1 Mallbrouck Monkey (*Cercopithecus cynosurus*), ♂. Prese by R. A. St. Leger, Esq.
1 Chacma Baboon (*Cynocephalus porcarius*), ♂. Presente F. Battersby, Esq.
11. 2 Spotted Eagle Owls (*Bubo maculosus*). Purchased.
2 Nilotic Crocodiles (*Crocodilus vulgaris*). Presented by C P. King, R.N.
12. 1 Hybrid Tapir (between *Tapirus americanus* ♀ and *Ta roulini* ♂). Born in the Menagerie. See P. Z. S. 1 p. 311.
13. 2 Grey-headed Love-birds (*Agapornis cana*), ♂ and ♀. chased.
14. 1 Common Buzzard (*Buteo vulgaris*). Presented by Lord W singham, F.Z.S.
1 Axis Deer (*Cervus axis*), ♂. Born in the Menagerie.
15. 3 Pluto Monkeys (*Cercopithecus pluto*), ♂, ♀, and juv. chased.
1 Blaubok (*Cephalophus pygmæus*). Purchased.
1 Mule Deer (*Cervus macrotis*), ♀. Presented by Dr. J Caton. See P. Z. S. 1882, p. 311.

Feb. 15. 1 Common Coot (*Fulica atra*). Purchased.

16. 2 Grey-headed Love-birds (*Agapornis cana*), ♂ and ♀. Purchased.

2 Russ' Weaver-birds (*Quelea russi*). Received in exchange.

17. 1 Bauer's Parrakeet (*Platycercus zonarius*). Presented by S. Draper, Esq.

18. 1 Common Raven (*Corvus corax*). Presented by Sir George Leith Buchanan, Bart.

20. 1 Rhesus Monkey (*Macacus erythræus*), ♂. Deposited.

2 Common Buntings (*Emberiza miliaria*). Purchased.

1 Black-necked Heron (*Ardea atricollis*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

21. 2 Black-headed Gulls (*Larus ridibundus*). Purchased.

1 Common Curlew (*Numenius arquata*). Purchased.

1 Bar-tailed Godwit (*Limosa lapponica*). Purchased.

22. 1 Waxwing (*Ampelis garrula*). Presented by W. H. St. Quintin, Esq.

23. 1 Bonelli's Eagle (*Nisaëtus fasciatus*). Deposited.

2 Blossom-headed Parrakeets (*Palæornis cyanocephalus*). Presented by Mrs. Francis Fox.

24. 1 Carrion-Crow (*Corvus corone*). Presented by F. H. Worsley Benison, Esq.

25. 1 African Brush-tailed Porcupine (*Atherura africana*). Presented by J. Cheetham, Esq.

28. 1 Four-horned Antelope (*Tetraceros quadricornis*), ♀. Born in the Gardens.

Mar. 2. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by S. Sidney, Esq.

A collection of Sea-Anemones. Purchased.

3. 1 Common Badger (*Meles taxus*). Deposited.

1 Common Jay (*Garrulus glandarius*). Presented by Lieut.-Col. Birch Reynardson.

4. 1 Common Peafowl (*Pavo cristatus*), ♂. Presented by Mrs. Walter Crane.

5. 1 Macaque Monkey (*Macacus cynomolgus*). ♂. Presented by Mrs. Richardson.

6. 1 Muscat Gazelle (*Gazella muscatensis*), ♂, Born in the Gardens.

1 Moor Harrier (*Circus maurus*). Presented by Mr. Cole.

8. 2 Common Buzzards (*Buteo vulgaris*). Presented by W. M. Baillie, Esq.

9. 1 Water-Vole (*Arvicola amphibius*). Presented by Mr. W. K. Stanley.

10. 1 West-African Python (*Python sebæ*). Deposited.

14. 2 Martinique Waterhens (*Porphyrio martinicus*). Presented by Lieut. A. H. Oliver, R.N.

15. 2 Common Badgers (*Meles taxus*). Born in the Menagerie.

16. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mrs. Hill.

1 Ruff (*Machetes pugnax*). Purchased.

17. 2 Redshanks (*Totanus calidris*). Purchased.

1 Ruff (*Machetes pugnax*). Purchased.

18. 1 Blotched Genet (*Genetta tigrina*). Deposited.

20. 1 Bonnet-Monkey (*Macacus radiatus*) ♀. Presented by Mrs. Nicholson.

2 Grey Ichneumons (*Herpestes griseus*), ♂ and ♀. Deposited.

Mar. 20. 3 Herring-Gulls (*Larus argentatus*). Presented by Rowlan Ward, Esq.
1 Herring-Gull (*Larus argentatus*). Presented by the Chevali Da Costa Ricci.
21. 1 Sclater's Curassow (*Crax sclateri*), ♂. Presented by Fr derick Youle, Esq.
1 King Vulture (*Gypagus papa*). Presented by Frederick Youl Esq.
22. 1 Wild Boar (*Sus scrofa*). Deposited.
25. 2 Tayras (*Galictis barbara*). Deposited.
1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by Hen Worth, Esq.
1 Puffin (*Fratercula arctica*). Presented by Henry M. Upche Esq., F.Z.S.
28. 2 Common Marmosets (*Hapale jacchus*). Presented by Geor Jacobs, Esq.
1 Silky Hangnest (*Amblyrhampus holosericeus*). Presented b George Jacobs, Esq.
1 Puffin (*Fratercula arctica*). Presented by Miss Lane.
25 Madeira Snails (*Helix maderensis*). Presented by Geor French Angas, Esq., C.M.Z.S.
4 Undulated Snails (*Helix undata*). Presented by George Frenc Angas, Esq., C.M.Z.S.
29. 1 Diana Monkey (*Cercopithecus diana*), ♂. Purchased.
1 Talapoin Monkey (*Cercopithecus talapoin*), ♀. Purchased.
1 Water-Chevrotain (*Hyomoschus aquaticus*). Purchased.
2 Green-billed Toucans (*Rhamphastos dicolorus*). Purchased.
1 Yellow-lored Amazon (*Chrysotis xantholora*). Purchased.
2 Maguari Storks (*Dissura maguari*). Purchased.
1 Common Night-Heron (*Nycticorax griseus*). Purchased.
1 Orinoco Goose (*Chenalopex jubata*). Purchased.
1 Egyptian Monitor (*Monitor niloticus*). Purchased.
31. 1 Radiated Fruit-Cuckoo (*Carpococcyx radiatus*). Purchase Sec P. Z. S. 1882, p. 358.

April 1. 2 Little Bustards (*Tetrax compestris*). Purchased.
1 Smooth Snake (*Coronella lævis*). Presented by Mr. W Penney.
1 Gaimard's Rat Kangaroo (*Hypsiprymnus gaimardi*). Born the Gardens.
2 Grey-backed White-eyes (*Zosterops dorsalis*). Presented Mr. J. Abrahams.
4. 1 Black-eared Marmoset (*Hapale penicillata*). Presented Mrs. Davidson.
1 Rifle-bird (*Ptilorhis paradisea*), ♂. Purchased. See P. Z. 1882, p. 421.
1 Jardine's Parrot (*Pœocephalus gulielmi*). Presented by Cap H. Hope Keighley, 2nd W. I. Regt.
5. 1 Mantchurian Crossoptilon (*Crossoptilon mantchuricum*), Purchased.
2 Japanese Pheasants (*Phasianus versicolor*), ♂ and ♀. Pu chased.
1 Amherst Pheasant (*Thaumalea amherstiæ*), ♂. Purchased.
1 Gold Pheasant (*Thaumalea picta*), ♀. Purchased.
1 Lineated Pheasant (*Euplocamus lineatus*), ♂. Purchased.
2 Black-backed Kaleeges (*Euplocamus melanotis*), ♂ and ♀ Purchased.

April 5. 2 White-crested Kaleeges (*Euplocamus albo-cristatus*), ♂ and ♀. Purchased.
1 Tigrine Cat (*Felis tigrina*). Purchased.
2 Black-headed Tragopans (*Ceriornis melanocephala*), ♂ and ♀. Purchased. See P. Z. S. 1882, p. 421.
6. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by F. W. Blackiston, Esq.
1 Ring-tailed Lemur (*Lemur catta*), ♂. Presented by Dr. J. Lea, M.R.C.S.
3 Zebra Finches (*Estrelda subflava*). Presented by Mrs. Beauclerk.
1 Crimson-eared Waxbill (*Estrelda phœnicotis*). Presented by Mrs. Beauclerk.
2 Amaduvade Finches (*Estrelda amandava*). Presented by Mrs. Beauclerk.
1 Shining Weaverbird (*Hypochera nitens*). Presented by Mrs. Beauclerk.
1 Singing Finch (*Crithagra musica*). Presented by Mrs. Beauclerk.
1 Nonpareil Finch (*Cyanospiza ciris*), ♀. Presented by Mrs. Beauclerk.
1 Common Buzzard (*Buteo vulgaris*). Presented by J. C. S. Rocke, Esq.
1 Common Partridge (*Perdix cinerea*), ♂. Presented by H. T. Bowes, Esq.
7. 1 Long-tailed Copsychus (*Copsychus saularis*). Deposited.
9. 1 Sambur Deer (*Cervus aristotelis*), ♀. Born in the Gardens.
12. 1 Lanner Falcon (*Falco lanarius*), ♂. Presented by Mr. Battersby.
1 Crested Screamer (*Chauna chavaria*). Purchased.
3 Chilian Pintails (*Dafila spinicauda*). Bred in the Gardens.
A collection of Sea-Anemones. Presented by R. W. Monroe, Esq.
13. 2 Golden-headed Parrakeets (*Brotogerys tui*). Received in exchange.
1 Malbrouck Monkey (*Cercopithecus cynosurus*). Presented by Robert Mills, Esq.
14. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by E. W. Hills, Esq.
15. 1 Vervet Monkey (*Cercopithecus lalandii*). Presented by Mr. T. W. Gourlay.
1 Black-backed Jackal (*Canis mesomelas*). Presented by Capt. E. Jones.
1 Common Raven (*Corvus corax*). Deposited.
1 Western Black Cockatoo (*Calyptorhynchus naso*), ♂. Purchased. See P. Z. S. 1882, p. 421.
1 Canada Goose (*Bernicla canadensis*). Presented by George Edson, Esq.
1 Chimpanzee (*Anthropopithecus troglodytes*), ♀. Purchased.
1 Great-billed Rhea (*Rhea macrorhynchus*). Purchased.
1 Indian Cobra (*Naia tripudians*). Purchased.
2 Indian River-Snakes (*Tropidonotus quincunciatus*). Purchased.
1 Blackish Sternothere (*Sternothærus subniger*). Purchased.
1 Müller's Parrakeet (*Tanygnathus muelleri*). Purchased.
1 Ludio Monkey (*Cercopithecus ludio*), ♂. Purchased.
1 Brazilian Tree-Porcupine (*Synetheres prehensilis*). Purchased.
1 Pardine Genet (*Genetta pardina*). Purchased.

April 15. 1 Kinkajou (*Cercoleptes caudivolvulus*). Purchased.

4 Rüppell's Parrots (*Pæocephalus rueppelli*) 2 ♂, 2 ♀. Purchase See P. Z. S. 1882, p. 421.

1 Angolan Vulture (*Gypohierax angolensis*). Purchased.

1 Magellanic Goose (*Bernicla magellanica*). Purchased.

1 Philander Opossum (*Didelphys philander*). Purchased.

17. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by V T. Fremlin, Esq.

1 Wheatear (*Saxicola œnanthe*). Purchased.

1 Meadow-Pipit (*Anthus pratensis*). Purchased.

1 Silvery Gibbon (*Hylobates leuciscus*). Purchased.

2 Squirrel Monkeys (*Chrysothrix sciurea*), 2 ♂. Purchased.

18. 1 Mungoose Lemur (*Lemur mongoz*), ♂. Purchased.

1 Red-fronted Lemur (*Lemur rufifrons*), ♂. Purchased.

2 Rufous-tailed Pheasants (*Euplocamus erythrophthalmus*), ♂ ar ♀. Purchased.

1 Cabot's Horned Tragopan (*Ceriornis caboti*), ♂. Purchase See P. Z. S. 1882, p. 421.

2 Cockateels (*Calopsitta novæ-hollandiæ*), ♂ and ♀. Present by Mr. W. C. Atkinson.

1 Common Raven (*Corvus corax*). Presented by H. E. Langto Esq.

19. 2 Short-headed Phalangers (*Belideus breviceps*). Born in tl Gardens.

1 Squirrel-like Phalanger (*Belideus sciureus*). Born in the Ga dens.

1 Burchell's Zebra (*Equus burchelli*), ♂. Purchased.

1 Eland (*Oreas canna*), ♂. Born in the Gardens.

1 Two-spotted Paradoxure (*Nandinia binotata*). Presented l A. W. Blyth, Esq.

1 Rufous Rat Kangaroo (*Hypsiprymnus rufescens*), ♀. Pr sented by C. Caravossi, Esq.

1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by M Ramsay.

1 Lanner Falcon (*Falco lanarius*). Presented by J. E. Hartin Esq. F.Z.S.

21. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*), c Deposited.

2 Grey-headed Love-birds (*Agapornis cana*), 2 ♀. Purchase

1 Red-start (*Ruticilla phœnicurus*). Purchased.

4 Slender Ducks (*Anas gibberifrons*). Bred in the Gardens.

22. 2 Common Cormorants (*Phalacrocorax carbo*). Bred in tl Gardens.

1 Common Night-Heron (*Nycticorax griseus*). Presented l H. D. Crompton, Esq.

1 Green Lizard (*Lacerta viridis*). Deposited.

24. 1 Black-backed Piping Crow (*Gymnorhina tibicen*). Purchase

25. 1 Slowworm (*Anguis fragilis*). Presented by Mr. Poyer Poy

2 Common Squirrels (*Sciurus vulgaris*), 2 ♂. Purchased.

26. 1 Bauer's Parrakeet (*Platycercus zonarius*). Presented by Mi Eva Maitland.

27. 1 Rhesus Monkey (*Macacus erythræus*), ♂. Presented by M Lamprey.

2 Uvæan Parrakeets (*Nymphicus uvæensis*). Purchased. Fro Uvea Island, Loyalty Group. See P. Z. S. 1882, pp. 421, 4 pl. xxvi.

28. 1 Chinese Tiger (*Felis tigris*), ♂. Presented by G. Brown, Es

April 28. 1 Black-backed Kaleege (*Euplocamus melanotis*), ♀. Received in exchange.

2 Axolotls (*Siredon mexicanus*). Presented by T. D. G. Carmichael, Esq.

5 Carpathian Scorpions (*Scorpio carpathicus*). Presented by T. D. G. Carmichael, Esq.

3 European Pond-Tortoises (*Emys europæa*). Presented by T. D. G. Carmichael, Esq.

29. 1 Bauer's Parrakeet (*Platycercus zonarius*). Presented by J. Charton Parr, Esq., F.Z.S.

1 Mississippi Alligator (*Alligator mississippiensis*). Presented by Master Bennett.

2 Variegated Sheldrakes (*Tadorna variegata*). Bred in the Gardens.

1 Hybrid Paradoxure (between *Paradoxurus larvatus* and *Paradoxurus leucomystax*). Born in the Gardens.

May 1. 4 Pygmy Hogs (*Porcula salvania*, 1 ♂, 3 ♀. Purchased. See P. Z. S. 1882, p. 546, pl. xxxvii.

1 Burmese Tortoise (*Testudo elongata*). Deposited.

1 Oldham's Terrapin (*Cyclemys oldhami*). Presented by B. H. Carew, Esq.

2 Green Monkeys (*Cercopithecus callitrichus*), ♀ and juv. Received in exchange.

2. 1 Red-handed Tamarin (*Midas rufimanus*). Purchased.

1 Golden-haired Tiger-Cat (*Felix chrysothrix*). Purchased.

1 Water-Chevrotain (*Hyomoschus aquaticus*). Purchased.

1 Mercenary Amazon (*Chrysotis mercenaria*). Purchased.

3 Chiloe Wigeons (*Mareca chiloensis*), 1 ♂, 2 ♀. Purchased.

1 Silky Bower-bird (*Ptilorhynchus violaceus*). Purchased.

3. 2 Blue-faced Honey-eaters (*Entomyza cyanotis*). Purchased.

6 Northern Marsh-Tits (*Parus borealis*). Presented by Mr. A. H. Jamrach.

14 Young Salmon (*Salmo salar*). Presented by Mr. Searle.

4. 1 Wild Duck (*Anas boscas*), ♀. Purchased.

5. 4 Yellow-billed Cardinals (*Paroaria capitata*), 2 ♂, 2 ♀. Purchased.

6. 1 Grey-headed Love-bird (*Agapornis cana*). Received in exchange.

8. 2 Common Snakes (*Tropidonotus natrix*). Presented by Lord Londesborough, F.Z.S.

1 Common Paradoxure (*Paradoxurus typus*). Presented by F. E. Spellerberg, Esq.

9. 1 Allen's Galago (*Galago alleni*). Purchased.

1 Bennett's Wallaby (*Halmaturus bennetti*), ♂. Born in the Gardens.

2 Long-eared Owls (*Asio otus*). Presented by Mrs. E. Brewer.

10. 1 Black-faced Kangaroo (*Macropus melanops*), ♀. Presented by C. T. H. Bower, Esq.

1 Swinhoe's Pheasant (*Euplocamus swinhoii*), ♀. Purchased.

4 Common Sheldrakes (*Tadorna vulpanser*), 2 ♂, 2 ♀. Purchased.

5 White-winged Choughs (*Corcorax leucopterus*). Purchased.

11. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by H. B. Hamer, Esq.

1 Levaillant's Cynictis (*Cynictis penicillata*), ♂. Purchased.

2 Talpacoti Ground-Doves (*Chamæpelia talpacoti*). Purchased.

May 11. 2 Beautiful Finches (*Estrelda bella*). Presented by Mr.
Abrahams.
1 Spotted Bower-bird (*Chlamydodera maculata*), ♂. Purchase
2 Alligator Terrapins (*Chelydra serpentina*). Presented by
E. Manigault, Esq.
1 American Boa Tortoise (*Terrapene carinata*). Presented
G. E. Manigault, Esq.
1 Serrated Terrapin (*Clemmys serrata*). Presented by G.
Manigault, Esq.
12. 4 Australian Dingo Dogs (*Canis dingo*). Born in the Gardens
1 Common Otter (*Lutra vulgaris*), ♀. Purchased.
14. 1 American Bison (*Bison americanus*). Born in the Gardens.
2 Silver-backed Foxes (*Canis chama*). Presented by Major-Ge
E. A. Bacon.
15. 1 Great Eagle Owl (*Bubo maximus*). Presented by the Ea
of Kilmorey.
1 Oak Dormouse (*Myoxus dryas*). Presented by Prof. Wrze
niowsky.
16. 1 Ruddy-headed Goose (*Bernicla rubidiceps*). Bred in t
Gardens.
1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented
Mr. F. Forman.
17. 1 Great American Heron (*Ardea herodias*). Purchased.
18. 1 Mediterranean Seal (*Monachus albiventer*). Presented by
Yeats Brown, Esq. See P. Z. S. 1882, p. 547.
2 Argus Pheasants (*Argus giganteus*), ♂. Presented by Maj
M'Nair, C.M.G., and J. M. Vermont, Esq. See P. Z.
1882, p. 547.
2 Common Buzzards (*Buteo vulgaris*). Presented by J. Fae
Esq.
19. 1 Collared Peccary (*Dicotyles tayaçu*). Presented by G.
Hawtayne, Esq., C.M.Z.S.
22. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*)
Deposited.
23. 1 Spotted Cavy (*Cœlogenys pacca*). Presented by V. Gibb
Esq.
1 Koala (*Phascolarctus cinereus*). Purchased. See P.Z.S. 188
p. 547.
2 Javan Peafowl (*Pavo spicifer*), ♂ and ♀. Purchased.
1 Black-breasted Sparrow (*Passer diffusus*), ♂. Presented
Mr. J. Abrahams.
1 White-throated Seed-eater (*Crithagra albogularis*). Presente
by Mr. J. Abrahams.
24. 1 Horned Lizard (*Phrynosoma cornutum*). Presented by Cap
E. C. B. Walker.
25. 1 Jackass Penguin (*Spheniscus magellanicus*). Purchased. Se
P. Z. S. 1882, p. 547.
26. 1 Red Brocket (*Cariacus rufus*), ♀. Presented by H. Sandbac
Esq.
1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Ga
dens.
1 Bordeaux Snake (*Coronella girondica*). Deposited.
1 Dark-green Snake (*Zamenis atrovirens*). Deposited.
3 Midwife Toads (*Alytes obstetricans*). Presented by Mons.
A. Boulenger.
14 Alpine Newts (*Triton alpestris*). Presented by Mons. G.
Boulenger.

May 27. 2 Cape Crowned Cranes (*Balearica chrysopelargus*). Purchased.
2 Bernicle Geese (*Bernicla leucopsis*). Purchased.
2 White-fronted Geese (*Anser albifrons*). Purchased.
1 Ruddy Sheldrake (*Tadorna rutila*). Purchased.
1 Herring-Gull (*Larus argentatus*). Purchased.
1 Flamingo (*Phœnicopterus antiquorum*). Purchased.
29. 1 Puma (*Felis concolor*). Presented by Capt. J. Jellicoe.
1 American Tantalus (*Tantalus loculator*). Presented by H. B. Whitmarsh, Esq.
2 Herring-Gulls (*Larus argentatus*). Bred in the Gardens.
30. 1 Purple Heron (*Ardea purpurea*). Purchased.
1 Negro Tamarin (*Midas ursulus*). Purchased.
1 Blue-crowned Hanging Parrakeet (*Loriculus galgulus*). Purchased.
1 Eroded Cinixys (*Cinixys erosa*). Purchased.
1 Red Deer (*Cervus elaphus*). Born in the Gardens.
31. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*). Purchased.
1 Java Sparrow (*Padda oryzivora*). Presented by Miss M. North.
1 Three-striped Paradoxure (*Paradoxurus trivirgatus*). Presented by R. H. Sterndale, Esq.
2 Rose-breasted Grosbeaks (*Hedymeles ludovicianus*), ♂ and ♀. Purchased.
1 Land-Rail (*Crex pratensis*). Presented by A. Battiscombe, Esq.
3 Brant Geese (*Bernicla brenta*). Purchased.
4 Summer Ducks (*Aix sponsa*), 2 ♂, 2 ♀. Purchased.
2 Common Wigeon (*Mareca penelope*). Purchased.
2 Great Anteaters (*Myrmecophaga jubata*). Purchased. See P. Z. S. 1882, p. 547.

June 1. 1 Rhesus Monkey (*Macacus erythræus*), ♀. Presented by Capt. E. B. Stevens, R.M.
1 Three-toed Sand-Skink (*Seps tridactylus*). Presented by J. C. J. Church, Esq.
1 Common Snake (*Tropidonotus natrix*). Presented by J. Poyer Poyer, Esq.
1 Slowworm (*Anguis fragilis*). Presented by J. Poyer Poyer, Esq.
1 Pig-tailed Monkey (*Macacus nemestrinus*). Presented by Miss R. M. Staveley.
1 Cape Zorilla (*Ictonyx zorilla*). Presented by Capt. Farmer.
1 White Pelican (*Pelecanus onocrotalus*). Presented by C. G. Bolau, Esq.
1 Emu (*Dromæus novæ-hollandiæ*). Purchased.
3. 2 Striped Hyænas (*Hyæna striata*). Presented by N. H. Beyts, Esq.
2 Himalayan Monauls (*Lophophorus impeyanus*). Bred in the Gardens.
4 Horned Tragopans (*Ceriornis satyra*). Bred in the Gardens.
2 Peacock Pheasants (*Polyplectron chinquis*). Bred in the Gardens.
5. 1 Mouflon (*Ovis musimon*), ♂. Born in the Gardens.
6. 2 Japanese Deer (*Cervus sika*), 2 ♂. Born in the Gardens.
2 Wood-Larks (*Alauda arborea*). Received in exchange.
7. 1 Cape Buffalo (*Bubalus caffer*), ♂. Born in the Gardens.

June 22. 1 Banded-tailed Tree-Snake (*Ahætulla liocercus*). Presented by C. A. Craven, Esq.

23. 1 Rude Fox (*Canis rudis*). Purchased.

1 Common Rhea (*Rhea americana*). Presented by J. Thomas, Esq.

1 Burmese Tortoise (*Testudo elongata*). Presented by B. H. Carew, Esq.

26. 2 Canadian Porcupines (*Erethizon dorsatus*). Presented by W. A. Conklin, Esq., C.M.Z.S.

1 Ring-tailed Pigeon (*Columba caribbæa*). Presented by C. Levy, Esq.

1 Yellow Wagtail (*Motacilla flava*). Presented by H. Grant, Esq.

1 Marsh-Tit (*Parus palustris*). Presented by H. Grant, Esq.

27. 1 Diana Monkey (*Cercopithecus diana*). Presented by Messrs. L. and J. Boljohn.

1 Canada Goose (*Bernicla canadensis*). Purchased.

4 Speckled Terrapins (*Clemmys guttata*). Presented by C. D. Ekman, Esq.

28. 2 Uvæan Parrakeets (*Nymphicus uvæensis*). Presented by E. L. Layard, Esq. From Uvéa, Loyalty Islands. See P. Z. S. 1882, p. 630.

1 Saisset's Parrakeet (*Cyanorhamphus saisseti*). Presented by E. L. Layard, Esq. From New Caledonia. See P. Z. S. 1882, p. 630.

1 Undulated Grass-Parrakeet (*Melopsittacus undulatus*). Deposited.

3 Geoffroy's Doves (*Peristera geoffroyi*). Bred in the Gardens.

1 Sharp-nosed Crocodile (*Crocodilus acutus*). Purchased.

30. 2 Tovi Parrakeets (*Brotogerys tovi*). Presented by Major H. Langford Brooke.

July 1. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by Mrs. Morris.

9 Fire-bellied Toads (*Bombinator igneus*). Presented by G. A. Boulenger, Esq.

1 Back-marked Snake (*Rhinechis scalaris*). Presented by G. A. Boulenger, Esq.

1 Lacertine Snake (*Cœlopeltis lacertina*). Presented by G. A. Boulenger, Esq.

1 Greenish Newt (*Notophthalmus viridescens*). Presented by Miss Sargent.

3. 1 Red-legged Partridge (*Caccabis rufa*). Presented by Dr. A. O. Grosvenor.

1 Ring-Ouzel (*Turdus torquatus*). Presented by H. A. Macpherson, Esq.

1 Goshawk (*Astur palumbarius*). Presented by Capt. Salvin.

4. 1 Horned Lizard (*Phrynosoma cornutum*). Presented by Master C. E. Napier.

5. 1 One-wattled Cassowary (*Casuarius uniappendiculatus*). Received in exchange.

7. 2 Chiloe Wigeons (*Mareca chiloensis*). Bred in the Gardens.

8. 1 Semiserrated Tortoise (*Testudo semiserrata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

18 Rough-scaled Lizards (*Zonurus cordylus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

10 Sepiform Lizards (*Pleurostrichus sepiformis*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

July 8. 21 Ocellated Geckos (*Pachydactylus ocellatus*). Prese
the Rev. G. H. R. Fisk, C.M.Z.S.

1 Streaked Euprepes (*Euprepes vittatus*). Presented by
G. H. R. Fisk, C.M.Z.S.

1 Dwarf Chameleon (*Chamæleon pumilus*). Presented
Rev. G. H. R. Fisk, C.M.Z.S.

1 Hoary Snake (*Coronella cana*). Presented by the Re
R. Fisk, C.M.Z.S.

29 Spotted Slowworms (*Acontias meleagris*). Presente
Rev. G. H. R. Fisk, C.M.Z.S.

1 Bipes (*Scelotes bipes*). Presented by the Rev. G. H.
C.M.Z.S.

41 Rosaceous Snails (*Helix rosacea*). Presented by t
G. H. R. Fisk, C.M.Z.S.

2 Black Leopards (*Felis pardus*, var.), ♂ and ♀. Pur

1 Hardwicke's Hemigale (*Hemigalea hardwickii*). Pur

1 Cuvier's Lagotis (*Lagotis cuvieri*). Purchased.

1 African Elephant (*Elephas africanus*), ♂. Purchase
P. Z. S. 1882, p. 630.

1 Malayan Tapir (*Tapirus indicus*). Purchased. See
1882, p. 768.

1 Prong-horned Antelope (*Antilocapra americana*), ♂.
chased.

2 Malabar Hornbills (*Buceros malabaricus*). Purchased.

9. 1 Red-sided Eclectus (*Eclectus polychlorus*). Presente
Lubbock, Esq.

10. 1 Three-coloured Lory (*Lorius tricolor*). Presented
Harraden, Esq.

1 Common Marmoset (*Hapale jacchus*). Presented by
Drabble, Esq.

11. 2 Ceylonese Hanging Parrakeets (*Loriculus asiaticus*).
chased.

1 Black-faced Ibis (*Theristicus caudatus*). Purchased.

1 Cedar-bird (*Ampelis cedrorum*). Purchased.

1 American Kingbird (*Tyrannus pipiri*). Purchased.

1 Annulated Snake (*Leptodira annulata*). Purchased.

61 Restless Cavies (*Cavia porcellus*). Presented by H.R
Prince of Wales, K.G.

12. 1 Great Eagle Owl (*Bubo maximus*). Deposited.

13. 1 Hybrid Macaque Monkey (between *Macacus cynom*
and *M. erythræus* ♀). Born in the Gardens.

1 Levaillant's Cynictis (*Cynictis penicillata*). Deposited

14. 1 Macaque Monkey (*Macacus cynomolgus*). Deposited.

1 Bonnet-Monkey (*Macacus radiatus*). Deposited.

1 Black-fronted Teetee (*Callithrix nigrifrons*). Purchas

1 Turquoisine Parrakeet (*Euphema pulchella*). Bred
Gardens.

1 Geoffroy's Dove (*Peristera geoffroyi*). Bred in the G

1 Puff Adder (*Vipera arietans*). Presented by Capt. H

1 Spot-bellied Snake (*Zamenis ventrimaculatus*). Purch

15. 6 Yellow-headed Troupials (*Agelæus xanthocephalus*).
chased.

1 Kolbe's Vulture (*Gyps kolbii*). Purchased. See
1882, p. 630.

1 Sociable Vulture (*Vultur auricularis*). Purchased.

16. 1 Sonoran Heloderm (*Heloderma suspectum*). Presente
John Lubbock, Bart., F.Z.S. See P. Z. S. 1882, p. 6

July 16. 1 Littoral Callichthys (*Callichthys littoralis*). Presented by George Little, Esq.

17. 1 Lace Monitor (*Varanus varius*). Purchased.

2 Australian Fruit-Bats (*Pteropus poliocephalus*). Purchased.

2 Californian Quails (*Callipepla californica*), ♂ and ♀. Presented by J. Biehl, Esq.

1 Sharp-nosed Crocodile (*Crocodilus acutus*). Presented by Mrs. A. H. Jamrach.

1 Black-breasted Peewit (*Sarciophorus pectoralis*). Purchased.

1 Varied Hemipode (*Turnix varia*). Purchased.

18. 2 Porto-Rico Pigeons (*Columba corensis*). Purchased.

1 South-American Jabiru (*Mycteria americana*). Purchased.

19. 1 Two-spotted Paradoxure (*Nandinia binotata*). Born in the Gardens.

1 Hybrid Muntjac (between *Cervulus muntjac* ♀ and *Cervulus lacrymans* ♂). Born in the Gardens.

20. 2 Demoiselle Cranes (*Anthropoides virgo*). Purchased.

2 Brown Thrushes (*Turdus leucomelas*). Purchased.

2 Blue-shouldered Tanagers (*Tanagra cyanoptera*). Purchased.

1 Striated Tanager (*Tanagra striata*), ♂. Purchased.

1 Allied Saltator (*Saltator similis*). Purchased.

2 American Scops Owls (*Scops asio*). Purchased.

2 Yellow Sparrows (*Passer luteus*). Purchased.

2 Beautiful Waxbills (*Estrelda formosa*). Purchased.

2 Coypu Rats (*Myopotamus coypus*), ♂ and ♀. Presented by Mr. A. A. van Bemmelen.

2 Common Night-Herons (*Nycticorax griseus*). Presented by Mr. A. A. van Bemmelen.

1 Egyptian Fox (*Canis niloticus*). Presented by Dr. Thomas Biddle.

1 Æsculapian Snake (*Coluber æsculapii*). Presented by Lord Arthur Russell.

1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Lady Parkyns.

A collection of Sea-Anemones. Purchased.

24. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.

4 Egyptian Ouarans (*Psammosaurus scincus*). Presented by Messrs. Wylde, Beyts, and Co. From Jeddah.

1 Ocellated Sand-Skink (*Gongylus ocellatus*). Presented by Messrs. Wylde, Beyts, and Co. From Jeddah.

11 Spot-bellied Snakes (*Zamenis ventrimaculatus*). Presented by Messrs. Wylde, Beyts, and Co. From Jeddah.

25. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by Mrs. Cumberleye.

1 Spotted Bower-bird (*Chlamydodera maculata*). Purchased.

4 Eyed Lizards (*Lacerta ocellata*). Purchased.

3 Black Rats (*Mus rattus*). Born in the Gardens.

1 Cornish Chough (*Fregilus graculus*). Purchased.

26. 1 Ring-necked Parrakeet (*Palæornis torquatus*). Presented by Mr. W. K. Stanley.

1 Yellow-billed Sheathbill (*Chionis alba*). Purchased.

1 White-billed Parrakeet (*Tanygnathus albirostris*). Purchased.

1 Hawk's-billed Turtle (*Chelone imbricata*). Purchased.

1 Humboldt's Lagothrix (*Lagothrix humboldti*). Purchased.

July 8. 21 Ocellated Geckos (*Pachydactylus ocellat* Ex-
the Rev. G. H. R. Fisk, C.M.Z.S.
1 Streaked Euprepes (*Euprepes vittatus* lens.
G. H. R. Fisk, C.M.Z.S. Bred
1 Dwarf Chameleon (*Chamæleon*
Rev. G. H. R. Fisk, C.M.Z.
1 Hoary Snake (*Coronella can* by H. R.
R. Fisk, C.M.Z.S.
29 Spotted Slowworms (ased.
Rev. G. H. R. Fisk, Purchased.
1 Bipes (*Scelotes bipes* Purchased.
C.M.Z.S. ased.
41 Rosaceous Snai Deposited.
G. H. R. Fis *us*). Purchased.
2 Black Leopar *drocygna viduata*). Purchased.
1 Hardwicke' *rus tataupa*). Purchased.
1 Cuvier's L *nchotus rufescens*). Purchased.
1 African (*Elaphis quaterradiatus*). Presented by
P. Z. S
1 Malay r Restless Cavies (*Cavia porcellus*). Presente
18 . The Prince of Wales, K.G.
1 Pr e Tortoise (*Testudo argentina*). Purchased.
2 on Chameleons (*Chamæleon vulgaris*). Purchased.
9. 1 rovandi's Lizards (*Plestiodon auratus*). Purchased.
equered Elaps (*Elaps lemniscatus*). Deposited.
10 Smooth Snake (*Coronella lævis*). Presented by W. Penne
Esq.
1 Lesser White-nosed Monkey (*Cercopithecus petaurista*). De-
posited.
1 Common Raccoon (*Procyon lotor*). Presented by Mark Vic
Esq.
1 Passerine Owl (*Glaucidium passerinum*). Presented by Mi
Maud Howard.
6 Common Guillemots (*Uria troile*). Presented by Sir Hu
Dalrymple, Bart.
1 Allen's Porphyrio (*Porphyrio alleni*). Presented by Mast
J. Kennedy.
1 Westerman's Cassowary (*Casuarius westermanni*). Pu
chased.
1 Egyptian Cobra (*Naia haje*). Presented by Eustace Pilla
Esq.
4. 1 Goffin's Cockatoo (*Cacatua goffini*). Deposited.
2 Mocassin Snakes (*Tropidonotus fasciatus*). Born in the Men
gerie.
1 Common Viper (*Vipera berus*). Presented by Mr. H. J. Be
well.
5. 1 White-headed Sea-Eagle (*Haliaetus leucocephalus*). Deposit
7. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by
Logie Pirie, Esq.
8. 2 Shags or Green Cormorants (*Phalacrocorax cristatus*). Pu
chased.
2 Common Boas (*Boa constricta*). Deposited.
9. 6 Common Kingfishers (*Alcedo hispida*). Presented by T.
A. Burnaby, Esq.
2 Silver Pheasants (*Euplocamus nychthemerus*). Presented
Mrs. Hames.

Aug. 9. 2 Slowworms (*Anguis fragilis*). Presented by Mr. Charles Taylor.
2 Common Vipers (*Vipera berus*). Presented by Mr. Charles Taylor.
10. 1 Moustache-Monkey (*Cercopithecus cephus*). Deposited.
2 Common Ravens (*Corvus corax*). Deposited.
1 Peregrine Falcon (*Falco peregrinus*). Presented by Col. A. Brooksbank.
11. 1 Peregrine Falcon (*Falco peregrinus*). Presented by Tom Broune, Esq.
14. A collection of Marine Fishes. Purchased.
16. 1 Black Rat (*Mus rattus*). Presented by W. E. Bryant, Esq.
17. 1 Thicknee (*Œdicnemus crepitans*). Presented by C. W. Harding, Esq.
1 Indian Python (*Python molurus*). Presented by Capt. Laws.
18. 5 Wild Boars (*Sus scrofa*). Presented by the Count de Paris.
19. 2 Blue-faced Lorikeets (*Trichoglossus hæmatodes*). Purchased.
1 Egyptian Cat (*Felis chaus*). Presented by Lieuts. Fisher and Farquhar and Mr. Basset, H.M.S. 'Bacchante.'
21. 1 Campbell's Monkey (*Cercopithecus campbelli*). Presented by the Rev. C. Harris.
1 Diana Monkey (*Cercopithecus diana*). Presented by the Rev. C. Harris.
4 New-Zealand Parrakeets (*Cyanorhamphus novæ-zealandiæ*). Purchased.
2 Alpine Parrakeets (*Cyanorhamphus alpinus*). Purchased.
2 Golden-headed Parrakeets (*Cyanorhamphus auriceps*). Purchased.
22. 1 Weeper Capuchin (*Cebus fatuellus*). Purchased.
1 Hairy Armadillo (*Dasypus villosus*). Presented by C. A. Craven, Esq.
1 Wood-Brocket (*Cariacus nemorivagus*). Presented by C. A. Craven, Esq.
4 Slender-fingered Frogs (*Leptodactylus pentadactylus*). Presented by Percy E. Scrutton, Esq.
23. 1 Brazilian Cariama (*Cariama cristata*). Presented by Capt. Jones
2 Peruvian Thicknees (*Œdicnemus superciliaris*). Purchased.
24. 1 Cape Zorilla (*Ictonyx zorilla*). Purchased.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
25. 4 Common Kingfishers (*Alcedo ispida*). Presented by Mr. G. Davis.
27. A collection of Sea-Anemones. Purchased.
28. 2 Southern River-Hogs (*Potamochœrus africanus*), ♂ and ♀. Presented by Col. J. H. Bowker, F.Z.S., and John Dunn, Esq. See P. Z. S. 1882, p. 631.
1 Red Brocket (*Cariacus rufus*), ♂. Deposited.
2 Scarlet Ibis (*Eudocimus ruber*). Purchased.
29. 1 Hairy-footed Jerboa (*Dipus hirtipes*). Presented by L. Adams, Esq.
4 White-headed Bullfinch Larks (*Pyrrhulauda verticalis*). Purchased.
2 Yellow Sparrows (*Passer luteus*). Purchased.
2 Crested Colins (*Eupsychortyx cristatus*), ♂ and ♀. Purchased.
30. 1 Himalayan Bear (*Ursus tibetanus*), ♀. Presented by E. J. Coope, Esq.

Aug. 31. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by Mrs. Crawford.
1 Grey Squirrel (*Sciurus cinereus*, var. *nigra*). Deposited.

Sept. 2. 1 Yellow Baboon (*Cynocephalus babouin*). Purchased.
1 Indian Chevrotain (*Tragulus meminna*). Presented by the Hon. John Stoddart.
11 Variable Leaf-Frogs (*Phyllomedusa dacnicolor*). Purchased. From Western Mexico.
1 Channelled Toad (*Bufo canaliferus*). Purchased. From Western Mexico.
2 Madagascar Boas (*Pelophilus madagascariensis*). Purchased.
5 Madagascar Boas (*Pelophilus madagascariensis*). Deposited.
3. 2 Crimson-winged Waxbills (*Pytelia phœnicoptera*). Presented by A. Krehl, Esq.
4 Four-coloured Shrike (*Laniarius quadricolor*). Presented by Col. J. W. Bowker.
4. 1 Leopard (*Felis pardus*), ♂. Purchased.
1 Small-eared Fox (*Canis microtis*), ♂. Purchased. See P. Z. S. 1882, p. 631, pl. xlvii.
2 Water-Chevrotains (*Hyomoschus aquaticus*). Purchased.
6 Spanish Blue Magpies (*Cyanopolius cooki*). Presented by Lord Lilford, F.Z.S.
3 Pleurodele Newts (*Pleurodeles walti*). Presented by Lord Lilford, F.Z.S.
1 Greater Vassa Parrot (*Coracopsis vasa*). Presented by Major-Gen. Hill.
5. 1 Crested Porcupine (*Hystrix cristata*). Presented by G. H. Garrett, Esq.
1 Spider (*Mygale*, sp. inc.). Presented by G. H. Garrett, Esq.
1 Scorpion (*Scorpio*, sp. inc.). Presented by G. H. Garrett, Esq.
1 Smooth Snake (*Coronella lævis*). Received in exchange.
1 Red-faced Saki (*Brachyurus rubicundus*), ♀. Purchased.
1 Weeper Capuchin (*Cebus fatuellus*). Purchased.
1 Erxleben's Monkey (*Cercopithecus erxlebeni*). Purchased.
1 Red-billed Toucan (*Rhamphastos erythrorhynchus*). Purchased.
6. 6 Sand-Lizards (*Lacerta agilis*). Presented by Herr J. Schliger.
7. 1 Hybrid Mouflon (between *Ovis musimon* ♂ and *Ovis aries* ♀). Presented by H.R.H. Prince Christian.
2 Common Barn-Owls (*Strix flammea*). Presented by Dr. Boyd, F.Z.S.
8. 1 Grey Ichneumon (*Herpestes griseus*). Presented by Mrs. Freeman.
1 Marsh-Ichneumon (*Herpestes paludosus*). Purchased.
9. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. Presented by W. Mason, Esq.
1 Rhesus Monkey (*Macacus erythræus*), ♀. Presented by Mrs. H. C. Dowson.
1 Ring-tailed Coati (*Nasua rufa*). Presented by Capt. Roxby.
2 Pennsylvanian Mud-Terrapins (*Cinosternon pennsylvanicum*). Presented by Mr. A. Forrier.
2 Adorned Terrapins (*Clemys ornata*). Presented by Mr. A. Forrier.
12. 1 Tiger (*Felis Tigris*), ♂. Received in exchange from the Zoological Gardens, Calcutta.
1 Geoffroy's Dove (*Peristera geoffroyi*), ♀. Bred in the Gardens.

Sept. 13. 1 Chacma Babooon (*Cynocephalus porcarius*), ♀. Presented by H. Banfield, Esq.

1 Moustache Monkey (*Cercopithecus cephus*). Presented by Mrs. Heath.

1 Horned Lizard (*Phrynosoma cornutum*). Presented by Wm. Pilcher, Esq.

14. 1 Squirrel Monkey (*Chrysothrix sciurea*), ♂. Deposited.

2 White-eared Conures (*Conurus leucotis*). Received in exchange.

1 Horned Parrakeet (*Nymphicus cornutus*), ♀. Received in exchange.

2 Dusky Parrots (*Pionus violaceus*). Received in exchange.

15. 2 Macaque Monkeys (*Macacus cynomolgus*), ♂ and ♀. Presented by F. J. Newton, Esq.

1 Ring-tailed Coati (*Nasua rufa*). Deposited.

3 Gold Pheasants (*Thaumalea picta*), 2 ♂, and 1 ♀. Presented by Theo. A. W. Hance, Esq.

6 Bamboo-Partridges (*Bambusicola thoracica*). Presented by Theo. A. W. Hance, Esq.

1 Common Moorhen (*Gallinula chloropus*). Presented by Theo. A. W. Hance, Esq.

1 Black Kite (*Milvus migrans*). Presented by Theo. A. W. Hance, Esq.

16. 1 Wapiti Deer (*Cervus canadensis*), ♀. Born in the Menagerie.

1 Great Anteater (*Myrmecophaga jubata*), ♀. Presented by Sir William Wiseman, R.N.

1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Presented by W. Marston Clarke, Esq.

18. 1 Rude Fox (*Canis rudis*). Presented by W. F. Bridges, Esq.

2 Chimachima Milvagos (*Milvago chimachima*). Presented by G. H. Hawtayne, Esq., C.M.Z.S.

1 Radiated Tortoise (*Testudo radiata*). Presented by Capt. R. Elwood.

1 Blue-crowned Hanging Parrakeet (*Loriculus galgulus*). Deposited.

19. 4 Banded Grass-Finches (*Poëphila cincta*). Bred in the Gardens.

20. 3 Common Hedgehogs (*Erinaceus europæus*). Presented by W. Bayes, Esq.

21. 1 Common Barn-Owl (*Strix flammea*). Presented by Mr. G. Paul.

1 Bengal Pitta (*Pitta bengalensis*). Purchased.

23. 1 Polecat (*Mustela putorius*). Purchased.

1 Purple-headed Glossy Starling (*Lamprocolius auratus*). Presented by J. Biehl, Esq.

25. 1 Hairy Armadillo (*Dasypus villosus*). Presented by F. R. Warre, Esq.

26. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mrs. Paris.

27. 4 Barbary Mice (*Mus barbarus*). Presented by Mons. Pichot.

3 Elliot's Pheasants (*Phasianus ellioti*), 1 ♂ and 2 ♀. Purchased. See P. Z. S. 1882, p. 631.

6 Florida Tortoises (*Testudo polyphemus*). Presented by G. E. Manigault, Esq.

28. 2 Macaque Monkeys (*Macacus cynomolgus*), ♂ and ♀. Presented by L. Bennett, Esq.

1 Eland (*Oreas canna*), ♀. Purchased.

1 Blue-and-Yellow Macaw (*Ara ararauna*). Presented by Mrs. Attenborough.

Sept. 29. 1 Nisnas Monkey (*Cercopithecus pyrrhonotus*),
by Mrs. F. Dixon.
2 Macaque Monkeys (*Macacus cynomolgus*),
sented by A. P. Fitch, Esq.
1 Black-faced Spider Monkey (*Ateles ater*). Pr
F. W. Graves.
2 Common Waxbills (*Estrelda cinerea*). Prese
à Court.
30. 8 Coquerel's Lemurs (*Chirogaleus coquereli*).
P. Z. S. 1882, p. 631.
1 Glutton (*Gulo luscus*). Presented by General
2 Malabar Squirrels (*Sciurus maximus*). Purch
1 Violaceous Plantain-cutter (*Musophaga violace*
1 Greenland Falcon (*Falco candicans*). Purcha
1 Razor-billed Curassow (*Mitua tuberosa*). Pu
1 Crested Curassow (*Crex alector*). Purchased.

Oct. 2. 1 Puff-Adder (*Vipera arietans*). Presented by
shay.
2 Illiger's Macaws (*Ara maracana*). Purchased
1 Ornamented Lorikeet (*Trichoglossus ornatus*).
2 Malaccan Parrakeets (*Palæornis longicauda*).
1 Jackal Buzzard (*Buteo jacal*). Purchased.
1 Crested Curassow (*Crax alector*). Purchased.
3. 1 Sykes's Monkey (*Cercopithecus albigularis*), ♀.
Capt. F. W. Schwedler.
2 Goshawks (*Astur palumbarius*). Presented
Blasius, C.M.Z.S.
6. 1 Common Raven (*Corvus corax*). Presented by
2 Lesser Black-backed Gulls (*Larus fuscus*).
G. Bury, Esq.
2 Brazilian Hangnests (*Icterus jamaicai*). Depo
7. 1 Australian Fruit-Bat (*Pteropus poliocephalus*)
Gardens.
1 Binturong (*Arctictis binturong*). Purchased.
1 Common Fox (*Canis vulpes*), ♀. Presented by
Brownrigg.
2 Greater Sulphur-crested Cockatoos (*Cacatua*
sented by C. Kerry Nicholls, Esq., F.Z.S.
10. 2 Macaque Monkeys (*Macacus cynomolgus*, 2 ♀.
A. Cornet, Esq.
1 Galeated Pentonyx (*Pelomedusa galeata*). P
A. Watkins, Esq.
1 Rufous Rat Kangaroo (*Hypsiprymnus rufescen*
the Menagerie.
1 Squirrel-like Phalanger (*Belideus sciureus*), ♀
Menagerie.
5 Delalande's Geckos (*Tarentola delalandii*).
Presented by Mr. A. D. Bartlett.
2 Sharp-headed Lizards (*Lacerta oxycephala*).
Presented by Mr. A. D. Bartlett.
4 Millipedes. Presented by Mr. A. D. Bartlett.
11. 1 Common Paradoxure (*Paradoxurus typus*). P
Louis S. Jackson, F.Z.S.
2 Black Wallabys (*Halmaturus ualabatus*), ♂
chased.
1 Golden Eagle (*Aquila chrysaetos*). Presented

Oct. 12. 1 Red-sided Eclectus (*Eclectus polychlorus*). Purchased.
13. 1 Grand Eclectus (*Eclectus grandis*). Purchased.
14. 1 Dormouse Phalander (*Dromicia nana*). Purchased.
16. 1 Common Marmoset (*Hapale jacchus*). Presented by Miss Katie Thomason.
17. 1 Naked-eared Deer (*Cariacus gymnotis*), ♀. Presented by Miss Lake.
18. 1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by H. T. Hardcastle, Esq.
1 Maholi Galago (*Galago maholi*). Deposited.
1 Common Paradoxure (*Paradoxurus typus*). Presented by J. Wood, Esq.
19. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
20. 1 Ruff (*Machetes pugnax*). Purchased.
1 Common Redshank (*Totanus calidris*). Purchased.
21. 1 Oystercatcher (*Hæmatopus ostralegus*). Presented by W. R. Temple, Esq.
23. 2 Canadian Beavers (*Castor canadensis*). Purchased.
3 European Tree-Frogs (*Hyla arborea*). Presented by Miss L. Burness.
24. 1 Laughing Kingfisher (*Dacelo gigantea*). Presented by H. G. Austin, Esq.
1 Rhesus Monkey (*Macacus erythræus*), ♂. Deposited.
25. 1 Eyra (*Felis eyra*), ♂. Purchased.
2 Sun-Bitterns (*Eurypyga helias*). Purchased.
1 Brown Gannet (*Sula leucogastra*). Purchased.
1 Matamata Terrapin (*Chelys matamata*). Purchased.
2 Globose Curassows (*Crax globicera*), ♂ and ♀. Purchased.
1 Razor-billed Curassow (*Mitua tuberosa*). Purchased.
24 Brown-tailed Gerbilles (*Gerbillus erythrurus*). From Arabia. Presented by Lieut. Paget, R.N.
9 Hairy-footed Jerboas (*Dipus hirtipes*). From Arabia. Presented by Lieut. Paget, R.N.
26. 1 Malbrouck Monkey (*Cercopithecus cynosurus*). Deposited.
1 Ceylonese Jungle-fowl (*Gallus stanleyi*), ♂. Presented by Mrs. Dick Lauder.
1 Muscovy Duck (*Cairina moschata*). Received in exchange.
27. 1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by G. H. Jones, Esq.
1 Greater Shearwater (*Puffinus major*). Purchased.
6 Knots (*Tringa canutus*). Purchased.
1 Common Lapwing (*Vanellus cristatus*). Purchased.
1 Spinose Land-Emys (*Geoemyda spinosa*). Presented by Miss C. G. Robson.
28. 2 Sharp-headed Lizards (*Lacerta oxycephala*). Presented by H. J. Clements, Esq.
31. 2 Common Cormorants (*Phalacrocorax carbo*). Deposited.
1 Razor-billed Curassow (*Mitua tuberosa*). Purchased.
1 Sclater's Curassow (*Crax sclateri*), ♀. Purchased.
2 Urumutum Curassows (*Nothocrax urumutum*). Purchased.
1 Naked-throated Bell-bird (*Chasmorhynchus nudicollis*). Purchased.
1 Ariel Toucan (*Ramphastos ariel*). Purchased.

Nov. 1. 2 Active Amazons (*Chrysotis agilis*). Presented by Arthur Munt, Esq., F.Z.S.

Nov. 2. 1 Chacma Baboon (*Cynocephalus porcarius*), ♂. Pr
Major Wood, R.A.
1 Chinese Quail (*Coturnix chinensis*), ♂. Presente
Walsingham, F.L.S.
3. 1 Indian Kite (*Milvus govinda*). Presented by Mrs.
2 Pennsylvanian Mud-Terrapins (*Cinosternon pennsy*
Deposited.
2 Speckled Terrapins (*Clemmys guttata*). Deposited.
1 Scorpion Mud-Terrapin (*Cinosternon scorpioides*).
1 Spanish Terrapin (*Clemmys leprosa*). Deposited
1 American Box-Tortoise (*Terrapene carinata*).
8 Douglas's Horned Lizards (*Phrynosoma douglasi*).
5 Garman's Lizards (*Sceloporus garmani*).
6 Spotted Lizards (*Holbrookia maculata*).
2 Confluent Rattlesnakes (*Crotalus confluentus*).
3 Say's Snakes (*Coronella sayi*).
1 Striped Snake (*Tropidonotus sirtalis*).
Presen
muel Ga
See P. Z
p. 719.
4. 1 Orbicular Horned Lizard (*Phrynosoma orbiculare*).
by Alfred Mapleson, Esq.
2 Grey Lag Geese (*Anser ferus*). Presented by Sir
Boyton, Bart.
1 Black-backed Kaleege (*Euplocamus melanotis*), ♂.
by Sir Henry S. Boyton, Bart.
6. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Pre
Mrs. Snell.
7. 1 Hawk's-billed Turtle (*Chelone imbricata*). Present
W. Cross.
8. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. De
1 Collared Fruit-Bat (*Cynonycteris collaris*). Bo
Menagerie.
3 Common Chameleons (*Chamæleon vulgaris*). Pre
Mr. W. J. Ford.
1 Black Wallaby (*Halmaturus ualabatus*), ♀. Depo
9. 3 Capybaras (*Hydrochærus capybara*), 2 ♂, 1 ♀. R
exchange.
1 Capybara (*Hydrochærus capybara*), ♀. Purchased.
1 Sooty Mangabey (*Cercocebus fuliginosus*), ♂. Pre
Lady Stafford.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Pre
J. Knight, Esq.
1 American Bison (*Bison americanus*), ♀. Purchase
2 Eastern Goldfinches (*Carduelis orientalis*), ♂ and
chased.
10. 1 Bluish Finch (*Spermophila cærulescens*). Received in
2 Globose Curassows (*Crax globicera*), ♂ and ♀. Pr
R. W. Ryass, Esq.
1 Greek Land-Tortoise (*Testudo græca*). Deposited.
11. 1 Shining Buzzard Hawk (*Asturina nitida*). Prese
H. Hawtayne, Esq., C.M.Z.S.
2 Brent Geese (*Bernicla brenta*). Purchased.
1 Red-throated Diver (*Colymbus septentrionalis*). Pu
1 River Lamprey (*Petromyzon fluviatilis*). Purchase
13. 1 Common Barn-Owl (*Strix flammea*). Presented
Wright.

Nov. 13. 2 Red-billed Tree-Ducks (*Dendrocygna autumnalis*). Purchased.
1 Zenaida Dove (*Zenaida amabilis*). Purchased.
15. 1 Peregrine Falcon (*Falco peregrinus*). Deposited.
2 Common Herons (*Ardea cinerea*). Presented by R. H. Rabbetts, Esq.
16. 1 Bonnet-Monkey (*Macacus radiatus*), ♂. Presented by A. S. Gissing, Esq.
1 Slender-billed Cockatoo (*Licmetis tenuirostris*). Deposited.
18. 1 Hairy-rumped Agouti (*Dasyprocta prymnolopha*). Purchased.
20. 1 Foster's Milvago (*Milvago australis*). Presented by Dr. A. M. M'Aldouie.
21. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by Mrs. Gratton.
22. 1 Northern Lynx (*Felis lynx*). Presented by Count Constantin Branicki.
3 Blue-crowned Hanging Parrakeets (*Loriculus galgulus*). Deposited.
23. 1 Isabelline Lynx (*Felis isabellina*). From Astor, Ballistan. Presented by Capt. Baldock, R.A. See P. Z. S. 1882, p. 720.
2 Hybrid Red-headed Pochards (between ♂ *Fuligula ferina* and ♀ *Aix sponsa*), ♂ and ♀. Presented by M. J. M. Cornély, C.M.Z.S.
1 Short-tailed Wallaby (*Halmaturus brachyurus*), ♀. Deposited.
1 Great Bustard (*Otis tarda*), ♀. Received in exchange.
1 Shore-Lark (*Eremophila alpestris*). Purchased.
24. 2 Snowy Owls (*Nyctea scandiaca*), ♂ and ♀. Purchased.
1 Moloch Monkey (*Callithrix moloch*). Purchased.
25. 1 Annulated Snake (*Leptodira annulata*). Presented by R. E. Seabrooke.
28. 1 Capybara (*Hydrochœrus capybara*), ♂. Presented by Mrs. R. H. Fitz-Simons.
30. 1 Bonnet-Monkey (*Macacus radiatus*). Presented by W. Nash, Esq.

Dec. 1. 1 European Scops Owl (*Scops giu*). Deposited.
4. 1 North-African Jackal (*Canis anthus*). Presented by Capt. W. F. Wardroper.
5. 2 Mexican Sousliks (*Spermophilus mexicanus*), ♂ and ♀. Presented by Mrs. Simmonds.
2 Raccoon-like Dogs (*Nyctereutes procynides*). Purchased.
1 Great Eagle-Owl (*Bubo maximus*). Presented by R. Leigh Pemberton, Esq.
7. 2 Leopards (*Felis pardus*), ♂ and ♀. Deposited.
8. 1 Black-headed Lemur (*Lemur brunneus*), ♂. Presented by the I Company 3rd Batt. King's Royal Rifles.
1 Black Lemur (*Lemur macaco*), ♀, Presented by the I Company 3rd Batt. King's Royal Rifles.
1 Martinique Waterhen (*Porphyrio martinicus*). Presented by F. L. Davis, Esq.
9. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by W. Percy Laing, Esq.
1 Common Squirrel (*Sciurus vulgaris*). Presented by the Hon. L. W. H. Powys.
1 Squirrel-like Phalanger (*Belideus sciureus*). Deposited.
11. 1 Chacma Baboon (*Cynocephalus porcarius*), ♀. Presented by J. W. Browne, Esq.

Dec. 11. 1 Red Kangaroo (*Macropus rufus*), ♂. Born in the Menagerie.
12. 1 Rhesus Monkey (*Macacus erythræus*), ♂. Presented by G. V. Sawyer, Esq.
1 Common Raven (*Corvus corax*). Presented by Mr. F. E. Dunton.
1 Ring-hals Snake (*Sepedon hæmachates*). Presented by H. Pillans, Esq.
1 Rhomb-marked Snake (*Psammophylax rhombeatus*). Presented by H. Pillans, Esq.
13. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*), ♂. Deposited.
2 Leadbeater's Cockatoos (*Cacatua leadbeateri*). Presented by by C. J. Harvey, Esq.
1 Long-eared Owl (*Asio otus*). Purchased.
14. 1 Marbled Cat (*Felis marmorata*). Purchased.
1 Common Barn-Owl (*Strix flammea*). Presented by the Rev. A. Reece.
15. 1 Weeper Capuchin (*Cebus capucinus*). Presented by A. J. M'Ewan, Esq.
1 Squirrel Monkey (*Chrysothrix sciurea*), ♂. Presented by Mr. M. Escaré.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Lady Sibyl Tollemache.
18. 2 Slender Loris (*Loris gracilis*). Presented by Dr. H. W. Lentaigne.
1 Crimson-crowned Weaverbird (*Euplectes flammiceps*), ♀. Presented by E. W. Gain, Esq.
19. 1 Common Heron (*Ardea cinerea*). Presented by W. H. Henderson, Esq.
20. 11 Muscovy Ducks (*Cairina moschata*). Presented by Major Finlay.
21. 1 Molucca Deer (*Cervus moluccensis*), ♀. Born in the Menagerie.
2 Bonnet-Monkeys (*Macacus radiatus*), ♂ and ♀. Presented by Nathaniel Cotton, Esq.
22. 1 Leopard (*Felis pardus*). Presented by Capt. A. Park.
1 Golden-eye (*Clangula glaucion*), ♂. Purchased.
23. 1 Hoary Snake (*Coronella cana*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Crossed Snake (*Psammophis crucifer*), ♀. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Rhomb-marked Snake (*Psammophylax rhombeatus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
2 Golden-winged Woodpeckers (*Colaptes auratus*). Purchased.
26. 1 Black-eared Marmoset (*Hapale penicillata*), ♂. Presented by Miss Tilleard.
28. 2 Common Curlews (*Numenius arquata*). Purchased.
1 Common Lapwing (*Vanellus cristatus*). Purchased.
1 Golden Plover (*Charadrius pluvialis*). Purchased.
29. 1 Grey Ichneumon (*Herpestes griseus*). Presented by W. L. Brodie, Esq.
1 Black Tortoise (*Testudo carbonaria*). Presented by Viscount Tarbat, F.Z.S.
1 Rose-hill Parrakeet (*Platycercus eximius*). Presented by George Lawson, Esq., F.Z.S.
30. 1 Indian Cobra (*Naia tripudians*). Presented by Captain Braddick.

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